ILLINOIS STATE GEOLOGICAL SURVEY ANNUAL REPORT

July 1, 1994 – June 30, 1995

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Illinois Department of Natural Resources
STATE GEOLOGICAL SURVEY DIVISION

ANNUAL REPORT TO THE BOARD OF NATURAL RESOURCES AND CONSERVATION

July 1, 1994 – June 30, 1995

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Printed by authority of the State of Illinois/1995/400/$1.66

TRANSITIONS

The last month of fiscal year 1995 was marked by the completion of two major transitions at the Illinois State Geological Survey. With my arrival on June 5, 1995, to begin my duties officially, the process of selecting a new Chief for the agency was completed. And, at the stroke of midnight on June 30, 1995, the transfer of the Survey into the newly created Department of Natural Resources became a reality.

One of the goals I have set as the new Chief is to make the people of Illinois more aware of the significance and the value of the Illinois State Geological Survey

At the close of his message in last year's annual report, Acting Chief Jonathan Goodwin noted that the Geological, Natural History, and Water Surveys and the Hazardous Waste Research and Information Center possess the right combination of scientific expertise and information resources to help the state undertake a balanced approach to ecosystem management. He also offered as an exciting challenge for the future Chief of the State Geological Survey the task of devising of "new ways for all the State's scientific divisions to undertake more cooperative research and service projects for the benefit of the people of Illinois."

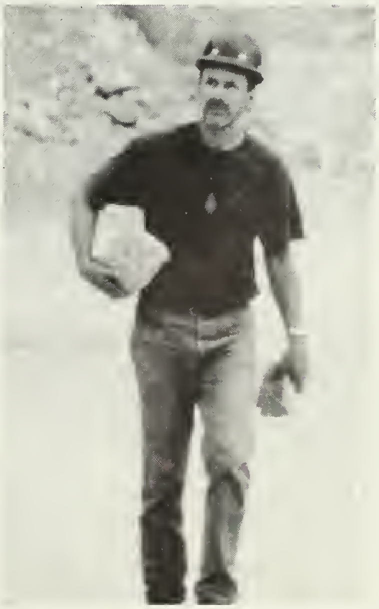
Within weeks of Dr. Goodwin's having posed that challenge, Governor Edgar issued the executive order to create the new Department of Natural Resources on July 1, 1995, and the staffs of the Scientific Surveys and Center had begun working together to plan various aspects of the transition to the new department. The merger of various administrative responsibilities is only the beginning of creating the new Department. Forming working relationships with new colleagues, building new lines of communication and understanding, and developing a common vision of the future are the more important tasks that lie ahead of us.

While these transitions were occurring, the members of the scientific and support staffs of the State Geological Survey continued to carry out their basic mission to study and report on the geology and mineral resources of Illinois. The achievements highlighted in this annual report provide only a glimpse at the range of activities performed by this remarkable organization during the past year.

In 1992, Illinois' gross state product was $296 billion, the fourth or fifth largest among the 50 states, and larger than the gross national products of many of the smaller developed nations. We in the United States, and in many other developed countries, sometimes forget that the development and use of natural resources form the foundation of our economies.

Ultimately, any product requires raw materials that must either be grown as a crop, or mined as a mineral ore, rock, or fossil fuel. Recycling can significantly reduce, but not eliminate, the continuing need for raw materials. For every person in Illinois and the rest of the United States, we consume about 8,000 pounds of crushed stone, about 6,000 pounds of sand and gravel, and about 900 pounds of portland cement each year. Through our research and service activities in the area of Energy and Mineral Resources, we are helping Illinois maintain the strength of its economy despite significant competitive challenges to our fossil-fuel-producing and -consuming industries and the impacts of urban development and changing patterns of land use on our ability to supply construction aggregates at the lowest possible cost to the consumer.

"History is subject to geology," said historians Will and Ariel Durant. The archaeological record is replete with evidence that major civilizations have collapsed before the onslaughts of nature. Illinoisans are unlikely to experience the destructive power of the tsunami that may have snuffed out the Minoan civilization on Crete or the nuée ardente that buried alive the people of Pompeii. Yet, the threat of significant damage and loss of life from a strong earthquake in either the New Madrid or Wabash Valley Seismic Zones cannot be ignored. The major floods of 1993 and the weather extremes of this year should remind each of us, and our political leaders, how vulnerable our societal structure can be in the face of the forces of nature.



William W. Shilts, Chief

Through our research and service activities in the areas of groundwater, environmental and engineering geology, we are providing the information needed by citizens and public officials to prepare and plan for the possible effects of an earthquake, to relocate whole villages away from flooding dangers, to manage erosion of the shoreline of Lake Michigan, and to either avoid or reduce the effects of other types of earth hazards, of both natural and human origin. Meanwhile, in the area of geologic mapping and framework studies, we continue the systematic detailed geologic mapping projects in southern Illinois. These 1:24,000-scale maps are planned for the entire state and will provide the digitally based earth science information needed for mapping the locations of fault traces related to earthquake potential, siting of waste disposal sites, including those designed to dispose of radioactive wastes, location and protection of aquifers, sources of the increasingly valuable aggregates needed to maintain and reconstruct our infrastructure, and so on. Finally, through our research in the area of geochemistry we are helping to find new ways of using waste materials from coal combustion and seeking to understand whether agricultural chemicals that may occur at high concentrations near distribution facilities pose a significant threat to groundwater.

The steady leadership of Jonathan H. Goodwin, Acting Chief from September 1994 to June 1995, served the Illinois State Geological Survey well. An able administrator with a working knowledge of all Survey research, Goodwin was a wise choice for the interim. (As one colleague pointed out, "He's done about every kind of job we have.") We placed our confidence in Jon Goodwin and found him "supportive," "never too busy to listen," "good at handling day-to-day business," and "always looking out for the quality of the science" while "focused on the public interest."

The strength and high reputations of the Scientific Surveys and the Center are the result of farsighted policies of the state government of Illinois, which has provided its citizens with scientific support for economic well-being and environmental protection unmatched by any other state. In the future, we will look for more and better ways to reach out to nonscientists so that they will know how to use this considerable expertise when they are confronted by earth-science-based problems or opportunities.

I have been with the State Geological Survey long enough to confirm my initial impression that it has an exceptionally talented and dedicated staff; our scientists tend to be national and international leaders in their diverse fields. To draw a more synergistic output from our Survey, I am committed to increasing our scientists' and support staffs' commitment to the team approach to carrying out our research—particularly encouraging them to tap into expertise available in our sister Surveys, the universities, and other institutions in and outside our department. To accomplish this, I hope to lead the State Geological Survey toward a program-oriented organizational structure and I will expect increased responsibility at the bench level. I hope to enhance the recognition of the indispensable role that support staff play in the team approach to science by systematically acknowledging and rewarding their efforts on behalf of the public and the scientists with whom they work so closely. By encouraging student participation at the graduate and undergraduate level in our scientific programs, I hope to influence more women and minorities to make their careers in the earth sciences so that we have a better balanced and more productive and representative scientific staff. Considerable progress had been made toward developing such balance at my previous institution, and I was an active participant in and advocate of the process.

Finally, I want to make all staff aware of our mission, which is to make the best possible, objective, earth science expertise available to promote the economic and environmental well-being of the people of Illinois, while maintaining a stimulating, fair, and pleasant working environment for all Survey staff.

Bill Shilts

William W. Shilts, Chief

ENERGY AND MINERAL RESOURCES

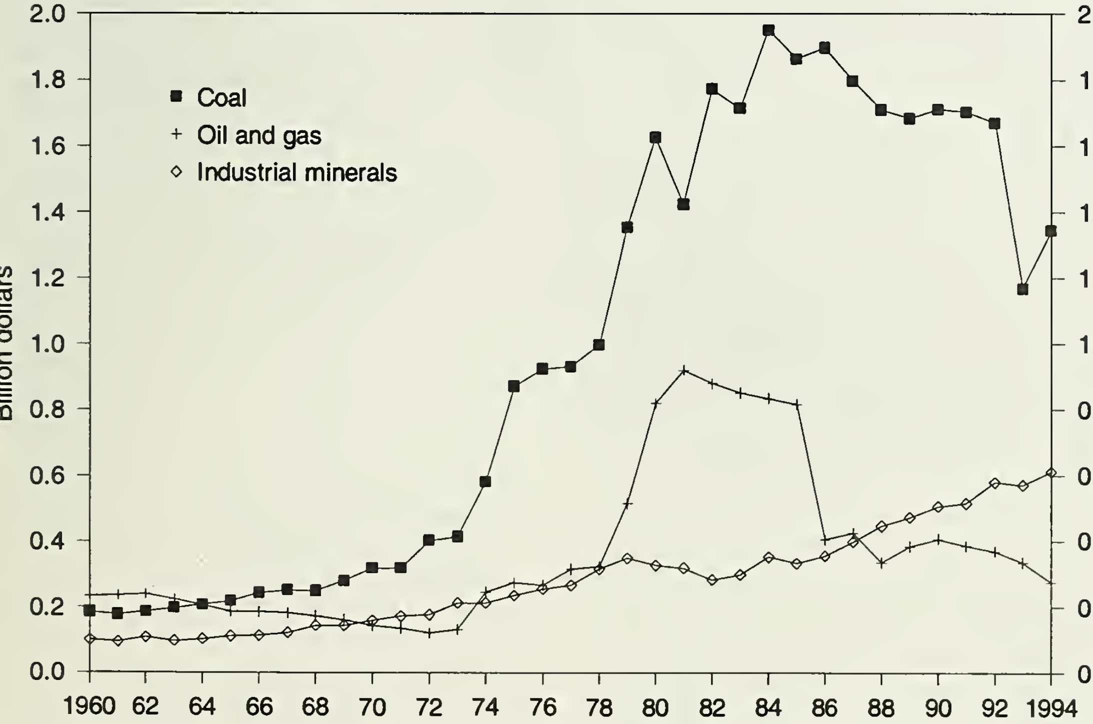
Technical, engineering, and economic data and expertise are provided to the Illinois coal, oil and gas, and minerals industries through the energy and mineral resource investigations and services of the Illinois State Geological Survey. The ISGS encourages "conservation" of the state's resources, defined here as efficient and environmentally responsible development. To that end, the ISGS characterizes and assesses the resources and provides economic analyses. Our investigations also look beyond to the applications of some of the state's fossil fuel and mineral wealth.

In 1994, the total value of minerals and fuels produced in Illinois amounted to $2.23 billion. International and national competition in the markets for fossil fuels and the effects of the Clean Air Act on the marketability of Illinois' comparatively high-sulfur coals have depressed prices. Meanwhile, the production and value of industrial minerals continue to increase (see below).

Coal

Phase I of the 1990 Clean Air Act Amendments, increasing price competition by western coal producers, and deregulation of electrical utilities are all factors forcing major structural changes in the coal mining and utility industries of the state. Several mines that produce high-sulfur coal are slated to be closed or their production suspended; invariably the 1990 amendments to the Clean Air Act are cited as the reason. All coal production in Illinois is being shifted to seams and mines that contain reserves of low- to moderate-sulfur coal. Competitive pricing of western coal, primarily from the Powder River Basin of Wyoming and Montana, is another strong factor. The increased transportation capacity of railroads and consequent lower transportation costs now permit western producers to offer their coal at a price per unit heating value below that for indigenous coal. Further deregulation of the utility industry will put even more pressure on utilities to seek the lowest cost coals because fuel costs constitute such a large portion of the utilities' total cost of producing electricity. Only mines with low production costs will be able to survive in the new market environment.

The ISGS assists the coal industry in Illinois through research and service. The Illinois Mine Subsidence Research Program, led by the ISGS, helped the industry remove important roadblocks to adoption of longwall mining systems. The industry is now aggressively adopting this highly productive mining method. Cooperation between industry and the ISGS in a coal-cleaning research project resulted in the expanded capacity of the cleaning plant at the largest coal mine in the state, thus helping this mine to



Value of minerals and fuels produced in Illinois.

Table 1 Mineral production data for Illinois in 1993 compared with preliminary data for Illinois in 1994[a]

		1993		1994[b]		% change from 1993 to 1994	
Minerals extracted	Unit	Quantity	Value ($1,000)	Quantity	Value ($1,000)	Quantity	Value
Fuels							
Coal	thousand tons	42,246	1,168,524	52,700	1,344,000	+ 23.7	+15.0
Crude oil	thousand bbl	19,090	334,075	17,148	275,000	- 10.2	- 18.0
Natural gas	million cu ft	250	575	245	441	- 2.0	- 24.0
Industrial and construction materials							
Stone[c]	thousand tons	73,500	338,100	74,000[f]	392,000[f]	+ 1.0	+ 16.0
Sand/gravel	thousand tons	40,273	189,389	42,000[f]	174,000[f]	+ 1.8	- 26.0
Clay[d]	thousand tons	188	1,147	n.a.	1,200	—	—
Metals, gemstones, and other undisclosed[e]			42,080		45,000	—	—
Total value of minerals extracted			2,073,895		2,230,441		+ 7.5

[a] Source: U.S. Bureau of Mines and Illinois Department of Mines and Minerals.
[b] Estimated by Illinois State Geological Survey.
[c] Dimension stone included with values that cannot be disclosed.
[d] Excludes fuller's earth; included with values that cannot be disclosed.
[e] Includes fluorspar, zinc, barite, peat, gemstones, fuller's earth, and tripoli.
[f] Estimated data.

compete in the new marketing environment. During the past year, ISGS coal geologists provided geologic and coal quality information to three groups of investors, two of which plan to open new coal mines in Vermilion County, which has relatively low sulfur coal reserves. One group has already applied for a permit from the Illinois Office of Mines and Minerals. The third group may open a new underground mine in southeastern Illinois, where the high heating value of the coal makes the reserves attractive. The ISGS recently completed a detailed coal resource study that helped to attract the company's interest to the area.

There's no better way to study the coal seam than to go down into the mine. In the Freeman United Coal Mining Company's Crown II mine in Macoupin County, ISGS coal geologist Phil DeMaris examines the contact of the Herrin Coal with the shale that makes up the "roof" of the seam. He's checking the rock for changes that relate to roof stability, or conversely, to roof falls. What he finds also tells him something about the coal's sulfur content—whether the quality of the coal is high enough to meet the needs of the customer.

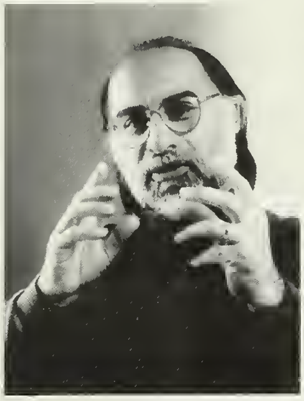
Revised Assessment of Coal Resources in Illinois A revised estimate of coal resources and reserves is being prepared for the Energy Information Administration of the U.S. Department of Energy (EIA/DOE). Since the previous statewide estimate was made in January 1979, more than 1 billion tons of Illinois coal have been mined or left in the ground as supporting pillars; several billion tons of additional resources have been mapped; and significant new data on the thickness and quality of coals have been acquired from many drilling logs donated to the ISGS. In the first year of this project (to be completed in September 1995), the resources of 28 coal seams in 79 counties are being updated to account for recent mapping of new resources and depletion of reserves due to mining to January 1994.

The update includes a detailed accounting of reserves by depth, sulfur content, rank, and heating value, and an estimate of the amounts of accessible and recoverable reserves. "Accessible" reserves are those available for mining, after accounting for current mining practices and restrictions due to land use and legal and environmental factors. "Recoverable" reserves are the estimates of coal that will become salable after subtracting losses from extraction and preparation (e.g. coal left as pillars, spilled in haulage, or lost in washing).

The first year's activities were reported to EIA/DOE in June 1995. The state's Demonstrated Reserve Base (DRB), a DOE-defined category for estimated coal reserves that meet specific criteria for their geologic certainty and economic minability, has been raised from 78 to 89 billion tons. New allocations of the DRB place 89% of the coal in the highest sulfur category (greater than 2.5 pounds of sulfur per million Btu, equivalent to greater than 5 pounds of sulfur dioxide per million Btu), as compared with 69% of the coal under the previous DRB allocation. The preliminary estimates of the accessible and recoverable reserves are 72 and 33 billion tons, respectively.

Novel Carbons from Illinois Coal for Natural Gas Storage Worldwide use of natural gas vehicles is increasing steadily—about 30,000 vehicles in the United States and more than 70,000 vehicles in other parts of the world. Adsorbed natural gas storage is being developed for vehicles running on natural gas because of its low capital and operational costs, compared with compressed natural gas storage. Carbon-based adsorbents have been found to have the most favorable gas storage density relative to other adsorbents such as zeolites. A key issue in commercial development of adsorbed natural gas storage technology is the availability of low-cost carbon adsorbents (less than $2 per pound) with a methane storage density greater than 150 Vm/Vs. (Vm is the volume of stored gas at standard temperature and pressure, and Vs is the volume of the storage container.)

ISGS research, supported in part by the Illinois Clean Coal Institute, seeks to develop a technology for producing cost-effective adsorbent carbons from Illinois coal and to evaluate the potential application of these materials for use in Adsorbed natural gas storage systems. The project began in September 1994. Carbon adsorbents produced to date from Herrin (No. 6) Coal have exhibited methane storage capacities comparable to or exceeding those of commercially available activated carbons; and the cost of manufacturing these products is estimated to be well below the target cost of under $2 per pound.



"Ideas people had 25 years ago are the basic pieces of today's programs," says chemical engineer Massoud Rostam-Abadi. "What we're working on now, we proposed at least 5 years ago. Now I'm thinking about research that will take us into the next century." Two to 3 years from now, Rostam-Abadi expects ISGS chemists and engineers to be working on materials applications of carbon, for example, carbon in composite materials. In the next 10 years, innovative developments in carbon research may help to "save" the environment.

Using Illinois coal to make carbon materials that capture sulfur dioxide from the flue gas of coal-fired boilers has been a target of ISGS research. "We're trying to make carbon adsorbents more effective," says chemist Joe DeBarr, "by improving their physical and chemical characteristics."

Gwen Donnals, chemist, makes her headquarters the TGA (thermal gravimetric analyses) laboratory. She has been running experiments that take oxygen in the form of carbon dioxide and carbon monoxide off the surface of char (like charcoal but made from coal, not wood) and enhance the char's adsorption of sulfur dioxide. "I feel strongly about this research," says Donnals. "We're looking for ways to use Illinois coal. Why use coal from other states when we can use our own?

Activated Char from Illinois Coal to Clean Up Incinerator Flue Gas A granular activated carbon suitable for removing dioxins, furans, mercury, particulate matter, and sulfur dioxide from incinerator flue gas has been produced from Colchester (Illinois No. 2) Coal. A German firm, STEAG, found this adsorbent acceptable for its process for cleaning incinerator flue gas. Tests on flue gas from a commercial incinerator in Europe, conducted for STEAG on a 250-kilogram shipment of this adsorbent, demonstrated that the efficiency of the ISGS-produced material for removing dioxins and furans was 99.72% to 99.98%. Because mercury in the flue gas after the adsorber was too low to be detected, a precise efficiency for mercury removal could not be calculated. The removal efficiency for cadmium and titanium was more than 90% and for antimony, arsenic, lead, chromium, cobalt, copper, manganese, nickel, vanadium, and tin—50% to 75%.

To qualify for use in STEAG's process, the adsorbent must pass the self-heating test so that it can be shipped without catching fire. The ISGS product is the only adsorbent made in the United States that has passed this test. Commercial activated carbons are too reactive.

The conditions used to prepare this carbon material were developed in bench-scale equipment at the ISGS Applied Research Laboratory. The three-step process of preoxidation, devolatilization, and activation was scaled up at the Process Test Center of Allis Mineral Systems in Oak Creek, Wisconsin, first in an 8-inch-diameter kiln, then in an 18-inch-diameter kiln. Because this adsorbent was produced in three straightforward steps from 1 × 6.4-millimeter (16 × 4 mesh) coal obtained from a commercial washing plant and briquetting was not necessary, its projected cost is lower than other carbon adsorbents available commercially in the United States.

Oil and Gas

The price of the oil produced by Illinois oil operators is determined by an international market. The past year saw prices at barely economic levels, and large numbers of marginally productive wells in Illinois were plugged and abandoned. Illinois is not alone in the perils associated with yielding the source for our major transportation fuel to foreign countries. The nation saw domestic production of oil fall to its lowest level since 1948 and oil from foreign sources exceed 50% of total U.S. consumption. Production in Illinois in 1994 was 17,147,995 barrels, down 3.26% from 1993. In 1994, 322 new test holes were drilled in Illinois. Of these, 195 were new oil production wells and 6 were new gas producers; 12 were reworked dry holes, of which 11 now produce oil and 1 gas. Unsuccessful dry holes made up about one-third of the total (109).

In the past 6 years, research at the ISGS has used advanced technology to enhance the understanding of Illinois' oil reservoirs. Using the results of this research, Illinois operators have leased new fields, drilled new wells, acquired new seismic profiles, and discussed field development plans with ISGS scientists—real exploration and production activities have been generated despite the relatively weak economic position of the industry.

Gas Storage in Illinois Illinois, one of the top states in gas storage, has 30 gas storage fields in 23 counties. Winter heating of homes in Illinois is largely dependent on gas pumped underground during the low-demand seasons. One field near Mahomet, for example, serves more than 1 million customers in 55 northeastern Illinois communities, including Chicago. This facility can deliver 1.2 billion cubic feet of gas per day through a 130-mile pipeline to Chicago.

Petroleum engineer Emmanuel Udegbunam and geologist Bryan Huff are working on the first gas storage study undertaken by the ISGS in 20 years. "I turned the geology into numbers," Huff says, "and Emmanuel used them in a computer simulation of the sandstone reservoir. Then he used the simulation to predict and model gas movement in the reservoir." The model simulates development scenarios for maximizing gas storage capacity and deliverability. "We're not only using the model to find out how much gas the field can hold, but also how much gas the utility company can withdraw on the coldest day of the year."

ISGS petroleum geologists and engineers have been applying their expertise in interpreting the heterogeneity of oil reservoirs to similar problems in gas storage fields. For a study of the Hillsboro Gas Storage Field in Montgomery County, they used engineering simulations of the reservoir to test various field development and operating strategies for improving the gas storage performance of the reservoir. Geologic data and interpretations were integrated with engineering methods to develop the reservoir simulation models.

Because construction of additional gas distribution pipelines from the major gas sources in the Gulf Coast is unlikely, maximizing the quantities of gas that can be stored in underground Illinois reservoirs is important.

New Exploration Methods and Concepts: Xenia East Oil Field, Clay County In Xenia East, a large amount of mobile oil remains in the marine bar reservoirs, according to a recently concluded reservoir characterization study (Xu and Huff 1995; see *Publications* section). Despite the possibilities, production has nearly been abandoned. An oil operator, who learned of the opportunities at Xenia through the technology transfer program at the ISGS, is now seeking Survey expertise in designing research to integrate geology, engineering, and operating strategies to optimize recovery in the field.

The ISGS and the oil company are pursuing funding from the U.S. Department of Energy (USDOE) for an improved oil recovery project that will extend the economic life of reservoirs in strandplain and barrier bar systems. If this promising proposal is awarded USDOE funding, the knowledge and experience gained in "resuscitating a dead field" will apply to other fields, both in the state and nationally.

Industrial Minerals

Future of the Chicago Area Aggregate Industry Stone quarrying, which began in the Chicago metropolitan area in the 1830s, is now a $120-million-per-year industry. Nearly all construction or industrial aggregate produced in the region is used locally. Inexpensive sources of these aggregate materials are essential for construction and critical for maintaining and improving infrastructure. Although known reserves of high-quality dolomite and limestone should be adequate to meet the region's needs well into the next century, the future availability of these resources is uncertain.

Geologic features, although an important control on the availability and quality of stone materials, are not the main constraint on the future of this industry in northeastern Illinois and elsewhere. Current estimates suggest that nearly half of the proven reserves owned by quarry companies and zoned for extraction may be lost through proposed quarry condemnations for use in public works projects and exclusions because of new environmental concerns. Cook County, both the largest source and the largest market for aggregates in the region, may be hardest hit with almost 60% of its proven reserves lost.

New local sources of stone may be be almost impossible to develop because of growing public opposition to opening new quarries and even to expanding existing ones. Stone to meet the demands for aggregate in the Chicago metropolitan area will have to come from more distant sources. Increased shipping costs will mean greatly increased costs for aggregate early in the next century, and will add tens of millions of dollars yearly to the cost of private and public construction.

With a long history of studying the geology of the entire state, the ISGS offers a unique

At the 550-acre Thornton Quarry in southern Cook County, Pubs Coordinator Ellen Wolf takes notes for her GeoNews *story on stone resources. Geologist Don Mikulic tells her, "Urban development is crowding out quarries."*

McCook Quarry spreads over 600 acres in west-central Cook County.

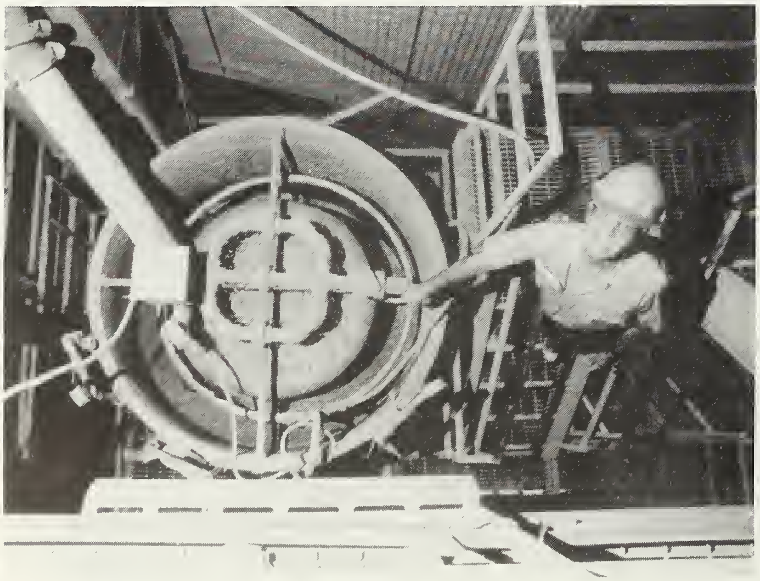
The ISGS has saved more than one quarry from mining substandard stone. Working with the Tuscola Stone Company in Douglas County are geologists Zak Lasemi and Rod Norby, part of a team examining rock core drilled from the 200-foot-deep quarry floor. "Bedrock arches upward here and comes close to the surface," explains Lasemi. "We'll study the regional trend of this 'arch' and analyze the rock core. The company can then decide whether to dig deeper or spread out."

regional perspective (and database) to help the stone industry solve these problems. Several projects are underway. The first, focusing on the geology of northeastern Illinois, will aid in more efficient utilization of known stone reserves and in locating new sources of stone materials. The second, a detailed survey of historical data, will identify production trends that can be used to predict future needs and uses of stone materials in the region. Other projects include assessing proven stone reserves and analyzing the economic impact that the loss of these reserves would have on the region.

Manufacture of Bricks with Fly Ash Additions The use of coal fly ash, a waste product of coal combustion, as an additive to clays in brick manufacture is the focus of a project involving ISGS clay mineralogists and chemists as well as members of the brick manufacturing industry. Waste fly ashes contain the equivalents of the three mineral groups in brick clays and therefore have the potential for use in manufacturing bricks. Modeling studies to develop new "recipes" for calculating the right mixture of fly ash, clays, and shales for brick manufacture are in progress. Results of the models will be used in plant-scale tests.

The mineralogical characterization of traditional brick clays has been completed. Continuing work will utilize ISGS databases on the chemical composition of commercially available Illinois coals to determine the most suitable fly ash sources, preferably near brick manufacturing plants.

Other benefits anticipated for this research are that the model for predicting the firing characteristics of fly ash or brick clays will also apply to predicting ash fusion temperatures in coal boilers; the test procedures for firing brick clays and ash fusion of coals are identical. The characterization methods for coal combustion residues—technology essential to this project—were developed in an earlier study in our laboratory.



Service to the mineral industries takes geologist Jack Masters to Hardin County in southernmost Illinois, where the only domestic producer of fluorspar, Ozark-Mahoning, is doing some exploration for new reserves. Masters delivers the message that the ISGS is willing and able to help them. During the report year, another ISGS geologist, John Nelson, interpreted rock cores for the company when he mapped the region for the statewide program called, appropriately, STATEMAP. In the processing plant, Masters points out a column flotation tank, which makes fluorspar concentrate. The chemical industry uses fluorspar for such products as refrigerants and welding rods, and of course, for fluoridation of toothpaste and water.

GROUNDWATER, ENVIRONMENTAL, AND ENGINEERING GEOLOGY

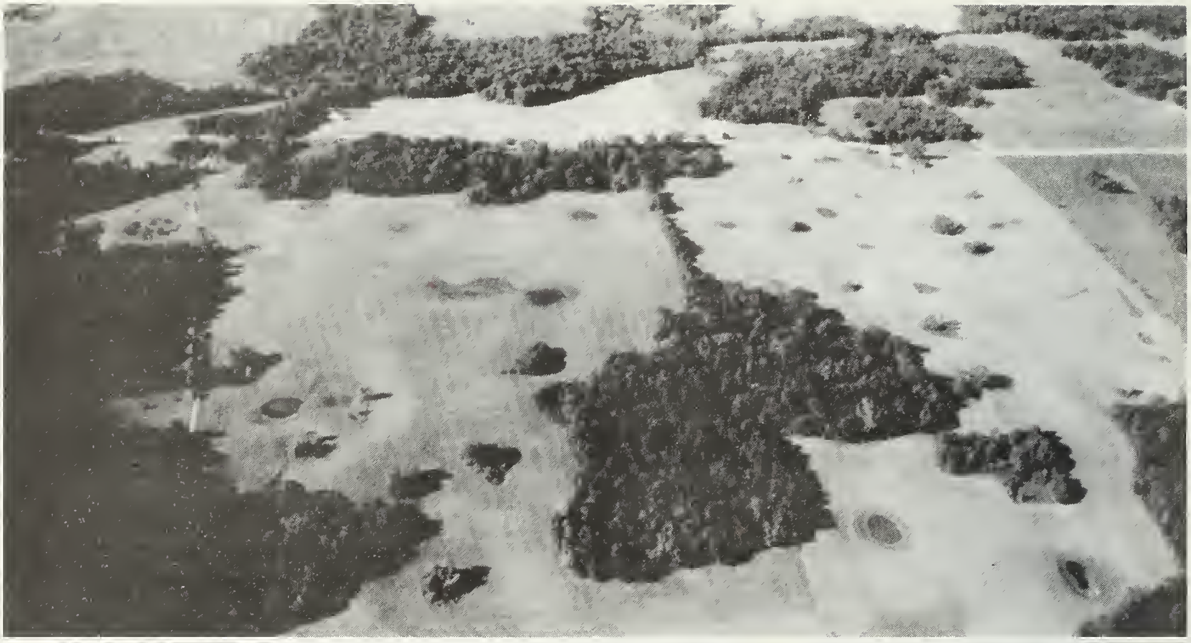
Public and private water resources and other environmental issues are addressed by groundwater, environmental, and engineering geology investigations and services at the ISGS. This area of the ISGS program has several significant types of studies:

- investigating the availability of groundwater resources and how to protect them from possible contamination,
- determining and reporting the geologic aspects of environmental assessments for proposed highway construction projects,
- defining the geologic processes causing sedimentation and erosion along the shores of rivers and lake and measuring their effects,
- establishing the hydrogeologic parameters that control natural and manmade wetlands,
- providing the geologic information needed to find suitable sites for relocating towns displaced by the recent major floods and for constructing factories, reservoirs, or landfills,
- developing scientifically based rationales for dealing with geologic hazards in Illinois (for example, providing earthquake hazard maps for use in response exercises conducted by the Illinois Emergency Management Agency).

To encompass the broad scope of these investigations requires the use of information gathered by all areas of the ISGS.

- Concerns about possible failure of levees and flooding of agricultural fields and villages were renewed this spring with the return of wet weather, which triggered major landslides at four locations. Investigations of the landslides are contributing critical data and insights for mitigating similar hazards in the future.
- Hydrogeological and geophysical investigations, conducted in cooperation with the Illinois State Water Survey (ISWS), are helping communities supplement their water supplies to provide for expanding populations and to bring present water supplies into compliance with quality standards.
- Results from the monitoring and analysis of sediment movement along the coast of Lake Michigan provide federal, state, and local government agencies and private landowners with a sound scientific basis for deciding whether to control shoreline erosion by providing nourishment materials for beaches, installing protective structures, or taking other actions.
- Instrumentation and periodic geochemical sampling and analysis provide indicators for determining whether wetland areas are being damaged by changes in the development of adjacent areas.
- Results from field investigations of the movement of pesticides through soils may help farmers, regulators, and pesticide manufacturers more accurately determine proper application rates for herbicides and pesticides.
- New earthquake probability maps are being used to identify areas of Illinois that would most benefit from earthquake response exercises. The activities highlighted below emphasize the diversity of ISGS programs and the sensitivity of our approach to the public's concerns.
- When the report, *Geology for Planning in Kane County*, was delivered this spring, county officials called it "the single most comprehensive study of the geology of the county, as related to landfill siting."

In a field near Elliot about 30 miles north of Champaign, Don Keefer works on the installation of a manhole access to a field drainage tile. It will hold equipment to record water levels and take water samples, all part of a plan to track how far and how fast pesticide-laden water moves through tile-drained farm soils. The study, funded by the USDA through the Illinois Groundwater Consortium, is yielding evidence that water moves much faster than expected. According to previous research, root holes may be at the root of the problem.



A bird's-eye view of Monroe County shows its beautiful but vulnerable landscape, pockmarked with sinkholes. About 5,000 square miles of Illinois has karst features developed in carbonate rock that dissolves easily, according to a 4-year ISGS study funded in part by DNR's share of the State's Environmental Protection Trust Fund. ISGS researchers sampling wells and springs found contaminants move rapidly into groundwater; it contains high concentrations of agrichemicals in the spring and higher-than-recommended levels of bacteria in the summer. Thanks to this study, the first of its kind in Illinois, the State now has a map of all its karst terrain, maps showing how likely the groundwater is to be contaminated, and year-round water quality data for vulnerable Monroe County.

Hydrogeologist Sam Panno collects groundwater samples at a spring, where water rushes out of a cave.

- The proposed site for a third airport to serve the Chicago–Indiana metropolitan area was discussed at a scoping meeting conducted by the Federal Aviation Administration and the Illinois Department of Transportation (IDOT). The ISGS provided information to address the geologic aspects of siting the facility.
- Officials of the Illinois Department of Nuclear Safety met with scientists from the ISGS and ISWS to review geologic and hydrologic information related to a July 1995 "Ingestion Pathway" emergency response exercise covering a 50-mile radius around one of the 13 nuclear power reactors in the state. A potential-for-contamination map based on the regional geology was used in the exercise.
- The ISGS was selected by the Central United States Earthquake Consortium (CUSEC) to coordinate and prepare a map of the seven-state CUSEC region showing the potential for earthquake hazards. This spring, the map was completed and distributed for final review.
- A time-series analysis of bathymetric data, spanning 1911 through 1992, demonstrates a decreasing rate of infilling of the harbor at the Great Lakes Naval Training Center. This finding, which indicates that the sediment flux in the harbor is now at or near dynamic equilibrium, has significant implications for the management of sediment supplies in the long-shore drift of the coast of Lake Michigan.
- Severe drought conditions at Camp Drake, the Boy Scout camp near Danville, required hauling water in the summer of 1994. A resistivity survey performed by ISGS staff located a potential water supply that has now been proven by a test well.

Environmental Studies and Assessments

Screening and Characterization Oversight Activities for Illinois' Low-Level Radioactive Waste Disposal Facility Public Acts 87-1267 and 88-458 amended the Illinois Low-Level Radioactive Waste Management Act. After more than 18 months of deliberations, the citizen Task Group charged by the laws with developing "criteria for selection of a site for a facility for the disposal of low-level radioactive waste away from the point of generation" recently distributed its proposed criteria for public review. The ISGS and ISWS must use the final approved criteria to screen the state to "identify at least ten locations, each of at least 640 acres, that appear likely to meet the criteria." The selection process, designed to examine all land in the state, uses all currently available data. The ISGS and ISWS are also charged with evaluating "any location of at least 640 acres that is volunteered by a landowner or unit of local government to determine whether the volunteered location appears likely to meet the criteria."

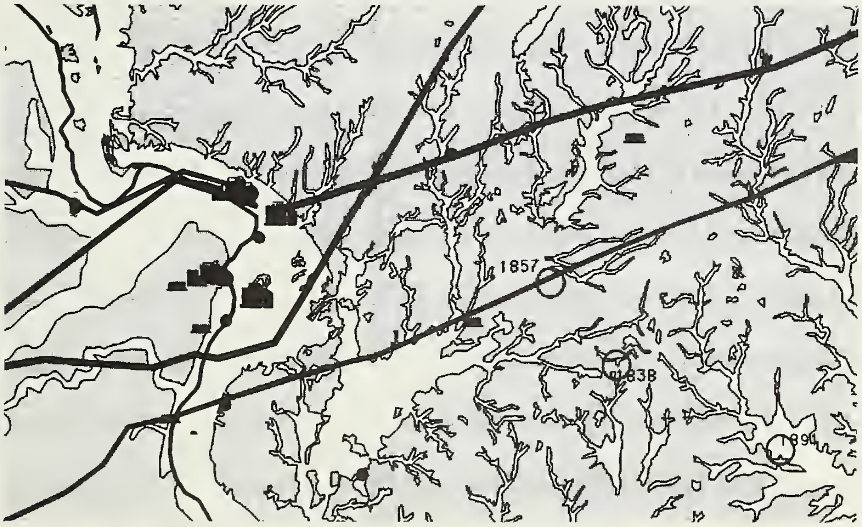
The ISGS/ISWS screening process will begin early in 1996, as soon as final criteria have been officially adopted by the Task Group. Digital coverages (1:500,000 scale) will be used first to identify and eliminate regions; the criteria used for the screening will be appropriate to this scale. In the next screening phase, more detailed maps (1:100,000 scale) will be constructed for areas that warrant further consideration. The screening process will conclude with a final review of potential locations. At least ten locations that appear likely to meet the siting criteria will be identified and reports written describing and documenting their topography, geology, hydrology, and other physical features. Each of the ten locations, as well as the sites volunteered by landowners or local governments, will also be evaluated in the context of the criteria developed by the Task Group.

Preliminary Environmental Property Assessments for the Illinois Department of Transportation The ISGS has designed procedures to alert IDOT planners and engineers to potential environmental problems at highway construction sites. Although the American Society for Testing and Materials (ASTM) recently published standards for conducting environmental site assessments (ASTM E1527-94), these procedures are primarily for assessment of a single parcel of land. Highway construction projects, however, may be 160 kilometers (100 miles) or more in length and involve hundreds or thousands of separate land parcels. The single-parcel assessment techniques described in the ASTM standards are prohibitive in time and cost for such large-scale projects.

To address the unique aspects of property assessments for highway construction projects, the ISGS has completed a manual that describes the processes and techniques developed in the past 6 years to conduct efficient, thorough highway property assessments.

Earth Hazards and Geotechnical Studies

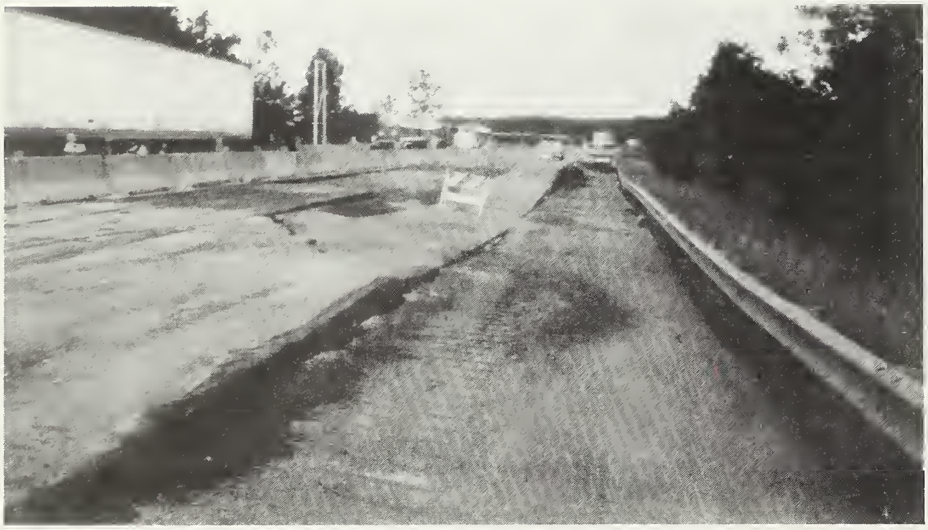
Earthquake Preparedness Exercise A new scenario has been developed for an earthquake preparedness exercise to be held in the nine-county Greater St. Louis region of southwestern Illinois on October 31, 1995. The ISGS, cooperating with the Illinois Emergency Management Agency, develops realistic scenarios of the effects an earthquake of a given magnitude might have if it occurred at a selected location, depth, and time. The variable effects of the earthquake event on different locations are mapped out according to the types of geologic materials found at and near the ground surface. These maps, showing areas of similar levels of damage, are used to develop lists of credible



Earthquake Hazards Map, *St. Louis area (scale 1:2,000,000) At a CUSEC meeting (Central United States Earthquake Consortium) in 1992, geologists from Illinois, Indiana, Missouri, Kentucky, Arkansas, Tennessee, and Mississippi decided to make maps that show how "quaking" is likely to affect different soils in the Midwest. These maps, along with earthquake probability maps, are being used for realistic scenarios depicting levels of damage that could result from earthquakes. Exercise drills, involving the ISGS and other agencies, test each State's readiness to respond to earthquake emergencies. Benefiting from the CUSEC program are Federal and State emergency management teams—and the people of Illinois.*

results of the expected shaking, such as locations of damaged shelters, collapsed buildings, and damaged electrical substations (no power), as well as areas that will have no water, no phones, roads blocked by landslides, hazardous chemical spills, and casualties. Notices of such incidents are sent to the emergency command centers at various times during the exercise. Each incident has to be handled by local, county, or state emergency managers and other participants from schools, hospitals, municipalities, power companies, insurance companies, the state police, and IDOT.

Landslide Database for Illinois Extremely heavy rains during May triggered several landslides that closed sections of state and federal highways and damaged personal property. One person died when a sudden landslide slammed into a house in Pekin.



Heavy rains during May 1995 led to the slope failure that took out two lanes at the junction of Interstates 57 and 70, just south of Effingham. The district office of the Illinois Department of Transportation asked that the ISGS send someone out to assess the situation. After Wen-June Su from the Engineering Geology Section reported his findings to IDOT, he added a detailed record of the event to the ISGS database on landslides.

IDOT asked the ISGS to investigate one of the sites. We collected information on changes in slope profiles, mode of failure, depth to groundwater, and material properties. The data allow us to produce models to show where the failure plane developed, causing movement in the slope. The ISGS maintains a database of landslide events. Continual collection of this type of information allows us to project problem areas in the state and explain to landowners how to reduce the risk of landslides in problem-prone areas and how to bring existing problems under control.

Groundwater Resources

Water Supply for De Witt and Piatt Counties The Mahomet Valley Water Authority (MVWA), which covers most of Piatt and De Witt Counties, is assessing the groundwater resources within its jurisdiction. MVWA trustees, aware of a joint ISGS/USGS project to map the geology of the Champaign quadrangle, contracted with the ISGS to extend the mapping to cover their area (1) to provide a regional stratigraphic framework for the glacial materials in the MVWA area, (2) to computerize all available well data, and (3) to locate areas for which only limited amounts of data are available. The report and series of maps prepared by the ISGS are being used by the MVWA for their assessment and to explain the sources of the water supply to people living within their jurisdiction.

The MVWA is interested in supporting an investigation focusing on areas where the Mahomet Valley Aquifer is not present; adequate water supplies are much more difficult to find in those areas. We are currently developing a new project to address these concerns of the MVWA.

Groundwater Protection

Transport and Fate of Agrichemicals in an Alluvial Aquifer During Normal and Flood Conditions Understanding how agrichemicals move from fields into groundwater or surface water systems is one of the keys to reducing their potential for contaminating water. ISGS researchers, with funding from the Illinois Groundwater Consortium, are studying the transport of nitrate and atrazine in an alluvial aquifer hydraulically connected with a river or stream.

At the Mount Pulaski well field in Logan County, nitrate has frequently been detected in monitoring and city production wells, often at levels above the drinking water standard (10 mg/L). Two of the wells drawing water from beneath a riparian woodland, however, have consistently shown nitrate concentrations below the allowable maximum. Riparian woodlands are known to reduce nitrate concentrations in soil water, and preliminary results from our study suggest that they can also reduce the nitrate concentration in shallow groundwater. By blending low-nitrate water from one of the production wells with higher nitrate water from two other production wells, the city can meet the drinking water quality standard for nitrate.

Lake Michigan Coast and Basin Studies

Coastal Monitoring at North Point Marina and Illinois Beach State Park Erosion has been a continuing problem along much of the Illinois shoreline of Lake Michigan. In recent years, severe erosion has occurred along the northernmost segment of the Illinois lake shore at North Point Marina and Illinois Beach State Park. The facilities, managed by the Illinois Department of Natural Resources (DNR), are two of the most heavily used DNR facilities in the state.

To efficiently design and implement beach nourishment, shore defense, and marina dredging projects, it is necessary to understand the rates of erosion and accretion, and the short- and long-term trends in coastal change. In 1995, the ISGS began a 4-year study, under DNR sponsorship, to survey the topography of the beach and nearshore underwater area, collect and analyze sediment samples, and take ground and aerial photographs to document erosion and accretion trends for the 15.6 kilometers (9.7 miles) of lake shore from the Wisconsin–Illinois state line south to Waukegan Harbor. The lake shore encompassed by the marina and state park comprises about 67% of this distance. The final goal of this 4-year study is the calculation of a detailed sediment budget that will be a basis for a regional approach to the management and conservation of sand moving along the coast in the longshore drift. Each year, the study will provide data on changes in sediment volumes and rates of shoreline erosion and aggradation for immediate decisions on coastal management.

Coastal geologist Mike Chrzastowski and new ISGS Chief Bill Shilts survey some of the badly eroded Lake Michigan shoreline at North Point Marina and the Illinois Beach State Park.

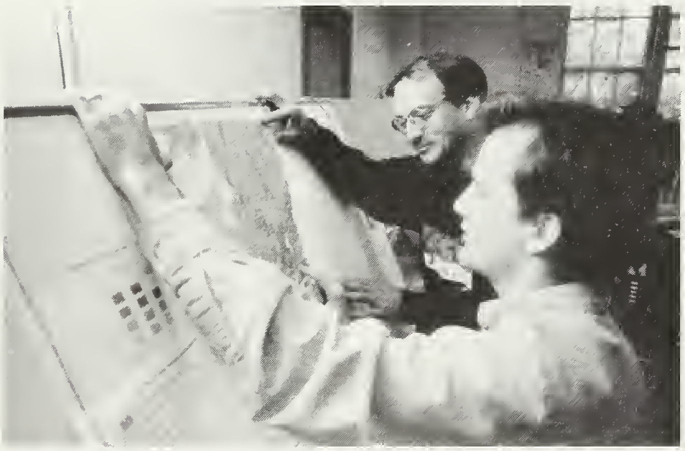
Geologist Brian Trask adjusts the transit and microwave transmitter to fix the position of the survey boat in the lake. In the distance, sand is being stockpiled at a beach "nourishment" site at the North Unit of Illinois Beach State Park.

GEOLOGIC MAPPING AND FRAMEWORK STUDIES

The field investigations for geologic mapping increase our knowledge of the earth through direct observation. Recently, mapping in far southern Illinois and adjacent Missouri led to the discovery of faults that rupture and displace relatively young (late Wisconsin episode) loessial and older (Pliocene to Pleistocene) fluvial sediments. The discoveries invalidate long-held beliefs that no surface rupture had occurred along faults in Illinois in the past several million years, and they have stimulated research into the character and extent of these neotectonic structures and their implications for earthquake hazard assessments.

Geologic maps, cross sections, and three-dimensional geologic models are invaluable for conveying information on earth resources and hazards. By displaying the distribution, character, and age of Quaternary (glacial) deposits and Paleozoic bedrock in Illinois, ISGS maps provide data for locating and assessing mineral, energy, and groundwater resources; evaluating earth hazards; monitoring environmental quality; estimating engineering characteristics; and determining other factors that directly affect the health, safety, and well-being of the people of Illinois. Although geologic mapping is a basic, continuous activity of the ISGS, only about 4% of the state has been mapped at a scale of 1:24,000 (1 inch on the map equals 2,000 feet on the ground).

Geologic framework investigations focus on the stratigraphic and structural classifications required for defining map units and meeting a host of practical and fundamental research needs. Revision of the lithostratigraphic framework for glacigenic deposits is underway. Bedrock framework studies throughout the Illinois Basin employ geophysical, stratigraphic, structural, and paleontological investigations and studies of geologic processes. Geophysical methods provide information about the deep crustal structures that now influence earthquake activity and, in the past, controlled the origin and development of the Illinois Basin and surrounding domes and arches and affected the distribution of mineral resources. Paleontological studies provide information needed to correlate stratigraphic units (the same bedrock layers at different locations), determine the relative ages of these ancient rocks, and interpret the original environments in which sediments were deposited. Understanding the geologic processes of deposition, erosion, and weathering, as they occurred under different climatic conditions in the past, helps with understanding the consequences of human modification of natural systems in the present.



Computer technology of the geographic information system (GIS) provides a way to visualize complex geology, manipulate large geoscience data sets, analyze spatial relationships, and compile and output maps . GIS analysts Paul Jahn and Dan Nelson, check the accuracy of the features and attributes (thickness, tonnage estimates, and depth) on the digital map of the Springfield Coal. Quality assurance/quality control, Jahn says, "is a means of making sure that the digital coverage matches the original map."

Several significant geologic mapping and framework activities took place during the report year:

- A cooperative ISGS/ISWS study, funded by the federal and state Environmental Protection Agencies (USEPA and IEPA), is using regional map data, stream hydrographs, and the GIS to evaluate interactions of groundwater and surface water throughout the state. The hydrogeologic settings (for example, slope/topography and geologic materials to a 50-foot depth) are being determined for watersheds or regions where rivers and streams have relatively high flow volumes under drought conditions. Significant stream flow during periods of drought generally indicates that a stream receives significant contributions from surface discharge of groundwater.
- Another joint ISGS/ISWS study, funded in part by the Department of Natural Resources, is assessing the potential vulnerability of the groundwater supply to wetlands with unique habitats in 85 Illinois Nature Preserves. Geologic and hydrologic characterization of the Spring Grove Fen in McHenry County is underway, as researchers conduct detailed geologic mapping, determine groundwater levels, and evaluate groundwater quality.
- In cooperation with the U.S. Army Construction Engineering Research Laboratories in Champaign, baseline field surveys and data collection have been completed at Fort Benning, Georgia, in preparation for monitoring a land rehabilitation project (from tank-training exercises). The findings from this study will be applicable to a planned tank-training site in Illinois.

- Two large data sets on pesticide occurrence at Illinois agrichemical facilities are being reanalyzed to improve soil sampling designs. Current guidelines and procedures for selecting locations for sampling and for designing statistically valid soil sampling schemes are not clear. Consequently, the reliability of data, analyses, and results can be suspect. This project will refine procedures that can be applied to environmental property assessments for hazardous wastes or pesticide contamination.
- ISGS scientists are serving actively on a Technical Advisory Committee for the Embarras River Management Association. Flood and erosion management in the drainage basin is the focus of the committee, which has reviewed data needs, information availability, and data relevance. The GIS database has been identified as containing information that would help this effort.
- A large-scale computer model was developed and used to map the sensitivity of aquifers to contamination in southern Will County. The model can be used for making land-use decisions regarding aquifer protection, waste disposal, and management of groundwater resources.
- A digital file of the surface topography of McHenry County was produced from scanned data supplied by the U.S. Geological Survey. This work is part of a work-share agreement with the USGS to produce digital line graph hypsography for eleven 7.5-minute quadrangles, which will be permanently archived in the National Digital Cartographic Data Base of the USGS.
- A 6-foot-long Anthracosaur amphibian fossil was discovered in upper Chesterian (Mississippian) rocks in the southeasternmost part of the Illinois Basin. A large, articulated amphibian foot, measuring 8 inches long and 6 inches wide, was found just above the base of an outcrop of the Palestine Sandstone in western Kentucky. Vertebrae, ribs, and femurs also were recovered. Although vertebrate fossils of approximately this age are known from Illinois, this is the first such fossil recovered in Kentucky. The amphibian is being prepared and studied by scientists at the Natural History Museum in Cincinnati, Ohio.
- During late May, an ISGS geologist joined with colleagues from the United States and Argentina in field investigations to determine the distribution and significance of ancient volcanic ash beds in western Argentina. The project, funded by the National Science Foundation, is examining the worldwide distribution of the ash beds, which have implications in the search for mineral resources and provide a precise reference to the timing of geologic events. The scientific community is showing considerable interest in the possible effects of these large ash falls on global extinction.
- A stratigraphic analysis was made of cores from two Superfund sites in northern Illinois as part of a joint effort with the USGS Water Resources Division in Urbana to assist the USEPA in assessing these sites.
- A major stratigraphic investigation of the Platteville and Galena Groups in eastern North America was completed. Together the Platteville and Galena constitute one of the most lithologically uniform and widespread rock units in the midcontinent. In northern Illinois, this 350-foot succession of dolomite and limestone is a major source of construction aggregate and groundwater resources. In southern Illinois, the rocks have yielded small to moderate amounts of petroleum. The same rocks have been major producers of petroleum in nearby Michigan and Indiana. A regional outcrop and subsurface investigation was undertaken to assess their resource potential. Results of the study were submitted for publication in the Special Paper series of the Geological Society of America.
- The conodont genus *Lochriea*, according to two ISGS papers published in the *Journal of Paleontology and Lethaia*, appears to be restricted to the Chesterian Series and is useful in the biozonation of these rocks.
- The Illinois Emergency Management Agency (IEMA) requested several copies of the "Levee Districts in Illinois Map" (1:500,000 scale) compiled during the 1993 flooding of the Mississippi and Illinois Rivers. The agency also requested new 1:250,000-scale maps of the Mississippi River for use in disaster assistance planning during flooding in May and June of 1995.
- The USGS Mid-Continent Mapping Center has prepared digital raster graphic (DRG) files of the sixteen 7.5-minute quadrangles encompassing Carroll County. The DRGs are digital images created by scanning the published USGS 7.5-minute quadrangles. They were used to produce a digital surface topography map to aid in digital preparation of subsurface geologic maps of Carroll County.
- A vintage work map (1928–30) showing the different drift units, such as moraines, from different glacial fluctuations in part of Kane County was digitized to archive the data on the deteriorating paper original. The data from this 1:31,680-scale (1 inch on the map equals

0.5 mile on the ground) work map, originally prepared by Leighton and Powers, will be used with water well driller records, field mapping, and new drilling to prepare maps of the surficial geology of the Geneva and Elburn 7.5-minute quadrangles.

- A project to automate and compile geologic map data for publication of a series of geologic quadrangle maps covering large parts of the Shawnee National Forest has been funded by the U.S. Forest Service. The information will serve the needs of USFS staff for managing projects in the forest.
- ISGS staff members are coordinating the September 1995 Midwest/Great Lakes Arc/Info User Conference in Champaign, Illinois. The topics are GIS technology and mapping applications.
- The computer network hardware at the ISGS was replaced with new equipment consisting of three major hubs connected with the latest fiber optic technology. Users will benefit from more reliable service and the ability to rapidly connect additional computers to the network.

Geologic Mapping

Methods Development To add to our understanding of the earliest glaciers on the midcontinent, ISGS geologists are mapping and characterizing deposits of the pre-Illinois episode in the central part of the state. The Illinois River appears to mark the boundary between pre-Illinois episode glacial deposits from eastern and western sources. In west-central Illinois, a primarily ice-deposited pebbly clay diamicton occurs on bedrock uplands and fills bedrock valleys, beneath a thin cover of sediments from later glaciations. Some deposits can be correlated to those described in Iowa. In east-central Illinois, pre-Illinois episode deposits consist of both diamictons and sand and gravel, and they are generally found deeply buried in bedrock valleys under a thick cover of younger glacial sediments, such as those in the Mahomet Bedrock Valley.

In the Wedron quarry near Ottawa in La Salle County, glacial geologist Ardith Hansel and Hilt Johnson, her colleague from the University of Illinois, examine well-defined layers of meltout till. Carried in the glacier, the debris (clay, sand, gravel, cobbles, and boulders) traveled 1,000 to 1,400 kilometers without mixing, then just melted out of the ice in distinct layers. Underlying the layered till is a homogeneous till (everything mixed up and fairly uniform) more typical of the glacial deposits found in Illinois.

Maps, cross sections, and publications updating the stratigraphic nomenclature of the deposits are nearly complete for the east-central Illinois portion of the study, which comprises the USGS-funded STATEMAP geologic mapping project for the Champaign quadrangle. Cross sections and three-dimensional slice maps have also been prepared. The project and its final map will be a model for detailed three-dimensional geologic mapping techniques of thick Quaternary deposits. The geologic studies of ancient glacial deposits together with regional mapping will provide the basis for evaluating groundwater resources and determining the suitability of geologic materials at or near ground surface for siting waste-disposal facilities.

Geologic Framework

Quaternary Faulting in Southern Illinois Slippage associated with fault traces along a newly mapped fault zone, called the Commerce Fault Zone, may have been responsible for three recent earthquakes in far southern Illinois. Based on the association of published epicentral locations of earthquakes within the fault zone, and field observations that have shown displacements of relatively young sediments elsewhere, it has been proposed that the Tamms earthquake of August 14, 1965 (mag.

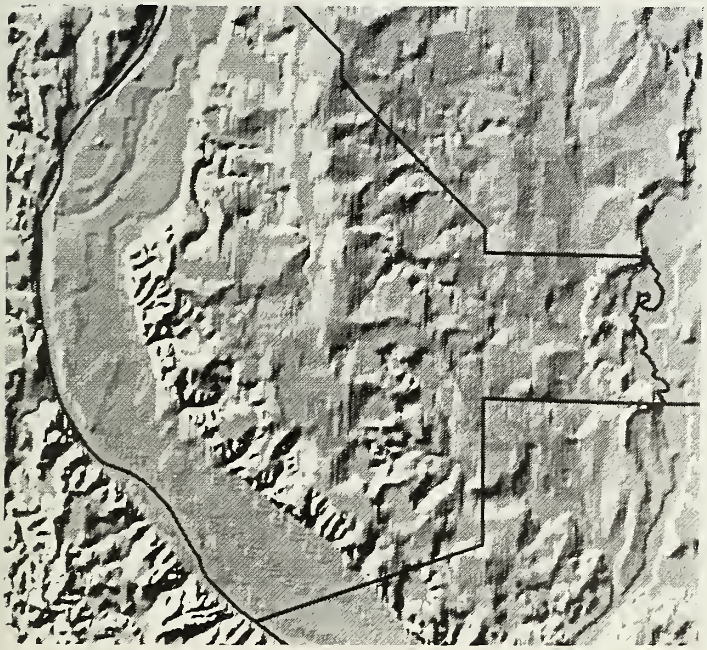
3.8), the Harrisburg earthquake of June 29, 1984 (mag. 4.1), and the Dongola earthquake of February 5, 1994 (mag. 4.2), may have been caused by movements on mapped fault segments in the northeast-trending Commerce Fault Zone. Evidence of relatively recent fault movement has been found in Missouri, a few miles from the Illinois border, where trenches dug across the fault zone by the U.S. and Missouri Geological Surveys reveal displacement of the Peoria Loess. This suggests fault movements that are younger than about 12,000 years. Regional gravity and magnetic mapping by Thomas Hildenbrand of the USGS further shows that the mapped position of the Commerce Fault Zone overlies a major lineament, interpreted by USGS scientists to represent a deep-seated fracture zone that extends from northeast Arkansas to the lower Wabash Valley in Indiana. To date, the association of the epicenters of modern earthquakes with the Commerce Fault Zone has not been shown to be anything more than a geographic coincidence. The coincidence is intriguing, however, and bears further investigation.

The ISGS drilled a 300-foot-deep core hole into a fault zone about 8 miles north of Metropolis in Massac County, Illinois. Analysis of fossil pollen indicates the cored sediments are of Quaternary age, implying large displacements along this fault zone within the last 2 million years. The ISGS is investigating several other sites of known or suspected Quaternary faulting in the Metropolis area. These studies are conducted with financial and technical support from the U.S. Geological Survey under the STATEMAP component of the NCGMP (National Cooperative Geologic Mapping Program) and NEHRP (the National Earthquake Hazards Reduction Program).

Spatial Analysis and Map Production

New GIS Maps Identify Sites Where the Geology Is Favorable for Landfills Elected officials and policy-makers from four counties are getting the information they need to carry

Curt Abert, of the Spatial Analysis and Map Production Section, consults with geologist Pius Weibel. Abert's 1:500,000-scale **Shaded Relief Map of Illinois** *(left) gives you the perspective of flying over the state at sunset, when shadows throw the land into relief. Weibel's map,* **Karst Terrains and Carbonate Bedrock of Illinois** *(1:500,000 scale), shows more karst in the state than people realize. If you're living in one of these areas, you would want to know, Weibel says, "because it's so easy to contaminate the aquifers in karst."*



out scientifically based landfill site selection. Geologic maps produced by the ISGS for the counties show the distribution and thickness of geologic materials, as well as their relative capability for hosting a landfill. Beginning in 1990, this project was partially funded through the Office of Recycling and Waste Reduction, Department of Energy and Natural Resources, and has involved a cost-share agreement with the counties. Since the recent reorganization of state government, the program has been coordinated by the Illinois Department of Commerce and Community Affairs.

The ISGS has used the GIS to compile and interpret subsurface geologic data and prepare interpretive maps (1:62,500 or 1:100,000 scale) for Champaign, Lake, and Will Counties. Map sets delivered to Lake and Will County included the following: surface topography, location of data points, bedrock topography, thickness of Quaternary deposits, and cumulative sand thickness. The map package included a series of geologic cross sections and a series of depth slices showing the distribution and thickness of sand and gravel in 50-foot intervals below the ground surface. An aquifer sensitivity map was produced to rank areas from highest to lowest potential for aquifer contamination. A complete set of preliminary maps has been produced for McLean County. In Carroll County, staff members have drilled and sampled nine holes to determine the depth to bedrock, the bedrock geology, and the thickness and character of the glacial deposits. A complete set of geologic maps will be presented to the county at the end of FY 1996.

Sally Denhart's computer screen displays the ISGS Internet Home Page, which she created this year. A big expansion is planned for next year when she will add excerpts from the ISGS newsletter* GeoNews, *highlights of ongoing research, lists of available data sets, and the column, "Ask a Scientist," that answers your questions about geology.

Computer Applications

Making ISGS Information Available over the Internet ISGS computers have been connected to the Internet through the University of Illinois for a few years; but until recently, this connection was used only for file transfer, remote log-in, or transmission of electronic mail. As use of the Internet for conducting business grew, and low-cost software for publishing and retrieving data over the Internet became available, the ISGS began a project to supply information to Internet users. A series of Internet documents has been designed to inform the public of who we are, what we do, and the information resources we offer.

The persons to contact on various geologic subjects, and a current list of ISGS publications and instructions on how to order them appear on the Internet. Also posted are the field trips that the Educational Extension Unit leads throughout the year. The data documents include an example of the customized, page-size well location maps that can be produced from the ISGS database of 350,000 wells. Release of data via the Internet is a way of providing access to information at little cost to citizens.

GEOCHEMICAL INVESTIGATIONS AND SERVICES

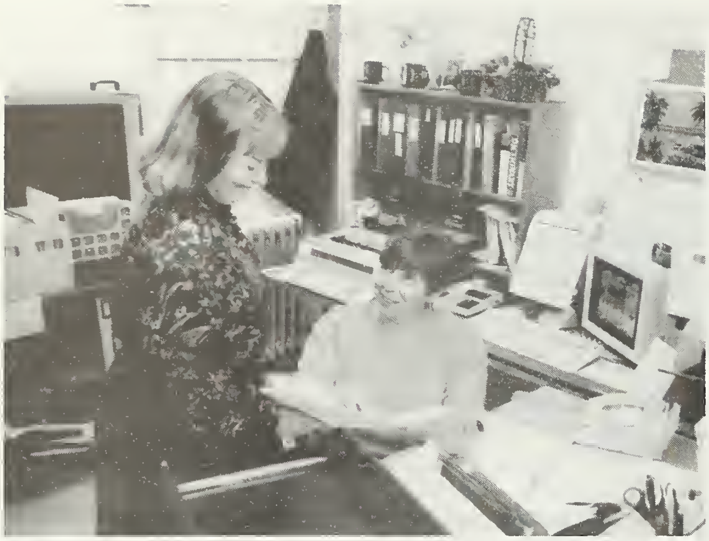
Geochemistry links the sciences of geology and chemistry. Much of what humans do in the world (mining, dredging, construction, farming, and disposal of wastes) disturbs the land and moves the spoils of such activities to environments far different from those from which the material came. The chemical and mineralogical changes that occur in the materials can have deleterious effects on the environment. Geochemists at the ISGS attempt to understand the changes so the activities that produced them can be modified or the deleterious effects prevented or remediated.

While conducting their own investigations, the Survey's geochemists also collaborate in the research of others. The group's analytical capabilities include determining the major, minor, and trace elements contained in rocks, coals, petroleum, sediments, waters, and gases; analyzing the molecular composition of naturally occurring organic compounds; measuring the carbon, hydrogen, nitrogen, sulfur, and oxygen isotope ratios of a wide range of samples; and precisely measuring the radiocarbon ages of materials dating back nearly 50,000 radiocarbon years before the present.

Several research projects are showing significant progress:

- In a joint project with researchers from the University of Illinois, sediment samples were collected on several occasions from Copper Slough, Phinney Branch, and the headwaters of the Kaskaskia River, which are all streams in Champaign County. The inorganic elemental composition of the samples was analyzed to monitor changes due to deposition and erosion from 1994 to 1995. Of the 83 samples collected, 50 have been analyzed.
- Analyses of the inorganic chemical compositions of 47 sediment samples from four lakes along the Illinois River and in Quincy Bay along the Mississippi River showed that manganese and phosphorus concentrations were significantly higher and sulfur concentrations were lower in the uppermost sediments than in the more deeply buried sediments. Sedimentation rates in the lakes were determined by the cesium-137 (^{137}Cs) method.
- As part of a study to help the Illinois Environmental Protection Agency develop water quality criteria for wetlands, 76 water samples were collected from 24 locations representing four different plant communities in natural wetlands. All the samples were analyzed for nutrients, major and minor cations and anions, and trace elements. Determining the relationship between water quality and plant and animal communities in natural, relatively undisturbed wetlands is expected to provide a scientific basis for setting water quality standards to use when remediating or constructing wetlands.
- The rate of oxidation of pyrite in coal slurry solids at nearly neutral conditions is being determined by experiments in which samples of coal slurry solids are leached for 2 days at a pH of approximately 7.8, then dried for 6 days. This sequence was repeated twice for two coal slurry solids. Sulfate in solution is used as the indicator of the degree of pyrite oxidation. The experiments are part of a project to test the feasibility of mixing coal slurry solids and fluidized-bed combustion residues to provide a medium for growing plants for the reclamation of coal slurry disposal ponds.
- Analyses of water samples collected quarterly from a reclaimed coal slurry impoundment in southern Illinois have shown that sulfate, the major anion, ranged in concentration from 1900 to 6000 milligrams per liter (mg/L) and calcium, the major cation, ranged in concentration from 450 to 610 mg/L in the four sets of samples. These high concentrations are probably due to the oxidation of pyrite followed by reaction of the resulting acid with calcium carbonate in the coal slurry solid. The data are for a study on the codisposal of fluidized-bed combustion residues and coal slurry solids.

"Classic" is how Gary Dreher, head of the Geochemistry Group, refers to Joyce Frost's research into the relationship of organic carbon to iron and sulfur in the New Albany Shale. Dreher is feeling the loss of a valued, senior chemist since Dr. Frost's retirement at the end of this report year. "We may be able to find someone to fill her slot, but her experience and knowledge of geochemistry will be very hard to replace."



"All the paperwork starts here," chorus the well-organized Gray and Kuchenbrod, who share an office and responsibilities for assisting two group heads. What would Gary Dreher (Geochemistry) do without Gail Gray to process the group's paperwork—correspondence, purchase orders, travel vouchers, contract appointments, change-of-status forms, payroll changes, manuscripts, more than a dozen accounting forms, ad infinitum...? Does Paul DuMontelle (Groundwater and Environmental Geology) find himself at a loss when Kim Kuchenbrod is out with a cold and her "in" box is filling up fast? No problem. "Kim knows my job and I know hers," Gray says. "We've cross-trained each other," Kuchenbrod adds. "We work as a team."

- The degradation of pesticides by naturally occurring microorganisms is being investigated as a potential method for cleaning up areas affected by spilled agricultural chemicals.
- Water samples were collected from 17 sampling points in nine wells penetrating an alluvial aquifer. Samples were also collected from the nearby stream and two quarry ponds. The analyses are being conducted to determine the effect of flooding on the concentration of nitrate and other agricultural chemicals in the aquifer, which is a source of drinking water for a nearby community.
- Research continues on the geochemistry of groundwater, effects of contaminants on groundwater, anaerobic decomposition of organic matter, and genesis of methane at Volo Bog in northeastern Illinois.
- The indicators of thermal maturity of oils in the Illinois Basin are being redefined and, as a result, mass balance calculations of residual oil in the Illinois Basin are being modified.
- Studies of the oxidation of organic carbon by sulfate-reducing bacteria in hypersaline microbial mats showed the presence of several different populations of these bacteria in the microbial mat community. Results of the research suggest that various groups of microorganisms in the community perform interrelated metabolic functions.
- In joint research with the Indiana Geological Survey, it was found that the previous interpretation of a freshwater environment of deposition of the Blue Creek coal, present in both Illinois and Indiana, appears to be incorrect. Newly acquired chemical data, reported in a paper given at the Goldschmidt Conference (May 1995), indicate a marine environment of deposition.
- The elemental characteristics of coal and limestone from Illinois were presented on a poster at the Conference on the Impact of Hazardous Air Pollutants on Mineral Producers and Coal-Burning Plants in the Ohio River Valley (March 1995). This seed project was conducted to encourage the sale and use of Illinois limestone in flue gas desulfurization.
- Data on the elemental and mineralogical composition of 30 samples of pre-Cambrian granitic rocks from the basement of the Illinois Basin were evaluated by Dr. Yang Ruiying of the Institute of High Energy Physics, Academia Sinica, Beijing, China, during her visit to the ISGS from August 1993 to February 1994.
- The Isotope Geochemistry Laboratory continued to offer services in isotopic analyses of water samples. Radiocarbon age determinations on geological and archaeological samples continued at a brisk pace. Installation of the instruments and other equipment needed to analyze samples for the presence of minute amounts of tritium (^3H) is nearly complete in our laboratory. This service will be offered to scientists throughout Illinois, beginning in September 1995.

Environmental Geochemistry

Fate and Transport of Atrazine Found in Surficial Materials at Agrichemical Facilities As a result of accidental spills and, in some cases, improper practices, the gravel fill materials at retail agrichemical facilities may hold relatively large concentrations of pesticides. The ISGS is investigating the potential for atrazine to migrate through these materials and into groundwater. Previous studies have indicated that several parameters affect the movement of atrazine in gravel fill or soils. To investigate these parameters, we constructed a field-scale model of a typical parking lot for controlled experiments of how atrazine moves through gravel fill.

The natural soil was removed and a flexible membrane liner installed in the excavation. The test cell, which is 9 × 9 × 0.9 meters, was constructed in eight layers consisting of (starting at the base) (1) a layer of sand 8 centimeters (cm) thick, (2) a sheet of geotextile, (3) a PVC liner, (4) a 5-cm-thick layer of sand, (5) a 10-cm-thick layer of washed gravel, (6) a sheet of geotextile, (7) a 56-cm thick layer of soil, and (8) a 20-cm thick layer of road-pack gravel.

The movement of water and atrazine through the road-pack gravel layer will be monitored using gauge tensiometers and vacuum-pressure lysimeters. So far, instruments have been installed and atrazine added to the surface of each quadrant in the test cell. Soil water and core samples of the fill and soil will be collected to determine the distribution of atrazine within the test cell.

Isotopic Analysis Methods and Services

Environmental Isotopic Investigation of Groundwater from the Aquifers along the Mahomet Bedrock Valley in East-Central Illinois The Mahomet Bedrock Valley Aquifer (MVA) is a major source of freshwater for east-central Illinois. This areally extensive, east-west-trending aquifer is an average 30 meters thick and overlain by a thick succession of glacial tills interbedded with sand and gravel deposits that are locally important aquifers for households and small communities. Chemical and isotopic analyses, including oxygen-18 (δ^{18}O), deuterium (δD), carbon-13 (δ^{13}C), carbon-14 (^{14}C,) and tritium (^{3}H), have been completed on several samples of groundwater collected from the MVA and associated shallower aquifers.

The δ^{18}O and δD analyses indicate that the water in the MVA was precipitated under climatic conditions similar to those of the present, which indicates that the groundwater can be no older than about 14,000 years before the present (BP). The ^{14}C and ^{3}H results indicate that the area of most recent recharge is in the northeast-central portion of the MVA. Some shallower aquifers in this region have significant tritium concentrations, indicating that recharge occurred less than 50 years ago. The western region and a northeastern arm of the MVA contained no significant tritium and had the lowest ^{14}C activities. These results are consistent with interpretations of other chemical and stratigraphic results from the same areas, and suggest greater isolation from surface infiltration and recharge from bedrock formations in these areas.

Determining the groundwater's age is complicated by the presence of microbial methane and the mixing of water from different sources. Current estimates indicate, however, that the groundwater in the MVA was last at the earth's surface about 3,000 to 10,000 years BP. The older ages reflect recharge from bedrock in the western MVA and northeastern arm of the MVA.

Organic chemist Joe Chou has been working on contaminated samples of gravel fill from agrichemical distributors. "I added nutrients—nitrogen and phosphorous—to increase the population of native bacteria and fungi," Chou explains. "I hope they'll 'chew up' the pesticides in the soil."

Pesticides are sometimes spilled in parking lots and loading areas at rural agrichemical facilities. "Do these 'spills' pose any threat to groundwater?" asks geochemist William Roy. The only way to answer the question was to recreate the problem in the field. In the winter and spring of 1994–95, Roy and fellow researchers built a "parking lot," installed instruments for monitoring fluid flow, then applied the pesticide atrazine. The next step is to analyze the water, soil, and gravel samples.

TECHNICAL AND ADMINISTRATIVE SERVICES

A variety of technical and administrative activities are necessary to support the Survey's research and service for the people of Illinois. Some of these functions include

- budgeting, planning, accounting, ordering, and receiving,
- editing, illustrating, and assembling camera ready copy of scientific and educational reports,
- recommending, purchasing, and installing microcomputer equipment and software and hardware repair and maintenance,
- maintaining and operating the buildings, scientific and technical equipment, and automotive equipment,
- designing and constructing customized laboratory and field instruments and equipment.

Services provided to the public include

- distributing publications, maps, documents, and other information to the public, government and media, and helping the public to understand the information,
- explaining the nature and purpose of our research and service activities,
- collecting and maintaining geologic records and samples for public use,
- reaching out to teachers, students, and the public through educational workshops, publications, and field trips that highlight the geology, landscape, and mineral resources of the state.

Information for the Public

Information Office For many people who visit, write, or phone the ISGS, the primary contact is a staff member in the Information Office. Last year, 9,383 phone calls were made to the main ISGS phone number. Visitors found a brighter, more inviting office due to renovations and installation of new displays. The staff worked with the Carterville office to offer ISGS maps and publications for sale, making them directly available to people in that area.

Distribution Statistics	FY 1994	FY 1995
ISGS publications	18,208	12,205
ISGS maps	7,232	4,440
USGS maps	22,200	20,628

Mail Center More than 5,200 customer orders were processed and packaged this year by Mail Center staff, who also maintained a well-ordered inventory of ISGS and USGS maps and publications. The Mail Center processes outgoing mail, receives and distributes all incoming U.S. and campus (university) mail, accepts shipments from all carriers, processes third class bulk mail, and stocks and distributes office supplies to all ISGS staff.

Earth Science Information Center Timely responses to 647 requests for geodetic and general cartographic information were supplied by the Center. New or revised editions of 50 maps in the 7.5-minute (1:24,000-scale) quadrangle series were released this year. Topographic maps are now available for all 48 quadrangles that cover Illinois in the 30 × 60-minute series (1:100,000 scale). Also, 74 county maps (55 planimetric, 19 topographic) have been published at this scale.

Library and Map Room Essential reference services are provided to ISGS staff and visitors by the Library and Map Room staff. Journals,

"Computers have changed libraries," says librarian Kristi Mercer. Checking a list of references, she saw a '1982' that didn't look right. So she's searching GeoRef, a database of publications in all languages, from all countries. "Our access to collections has expanded dramatically, thanks to the Internet," she adds. Survey people can use their own PCs to get to the library computer at the University of Illinois, and through it, to collections anywhere in the world. "But don't think you have *to do it yourself," says Mercer. "We save people so much time. They can spend hours looking for something that we can find in minutes."*

acquisition lists, and other materials are routed to notify staff members of new publications and developments in their fields. Citations are verified; bibliographies prepared; literature searches run (using online, CD-rom, and paper databases); and articles, books, and reports are located and borrowed from libraries throughout the world. Much of this is being handled over the Internet, which allows the library staff to link directly with worldwide resources. This year the library began a retrocon project that is adding the library's holdings to the Lincoln Trail Libraries System online catalog on Illinet. Improved online access will make our library more useful throughout the state.

Duplicating Shop Nearly all ISGS publications are prepared in our Duplicating Shop, where they are printed, sorted, bound, and trimmed. The Duplicating Shop also produces ISGS letterhead and envelopes, business cards, order forms for the Information Office and Geologic Records Library, brochures, and new publication announcements. Last year, more than 1,378,000 impressions were run.

Technical Information Officer To aid in the dissemination of information, the Technical Information Officer (TIO) helps the Survey's scientists interpret complex technical issues for the lay public and present their scientific results in the press. Contacts with the news media and trade journals are supplemented with news releases, fact sheets, feature articles, displays, and other informational materials. The TIO found several opportunities for scientists to participate in educational television programs for public broadcasting and in two science videos which will be made available to schools in the state. As coordinator of a speakers bureau for the ISGS, the TIO arranged for staff members to make presentations to governmental organizations, schools and service clubs, including special occasions during Earth Week and Earth Day. In addition, the TIO represented the ISGS at selected workshops, conferences, fairs, expositions and other public events to explain the benefits of the Survey's efforts to public officials and industry. Considerable assistance was provided to members of the scientific staff by coordinating and arranging for the presentation of displays or exhibits about the Survey's research and service program at selected events.

Still a big fan of the Survey's geoscience field trips, retired Chief Leighton waits his turn while kids crowd around the sign-up table.

Educational Extension and Public Outreach

Geological Science Field Trips The ISGS conducted its popular, educational field trips during the fall of 1994 and the spring of 1995. The trip to the Elizabeth area of Jo Daviess County in northwestern Illinois on September

Treasure hunters search for brachiopod fossils, some with small calcite crystals, at a quarry in western Illinois.

Water wells, oil and gas wells, engineering borings—name your hole in the ground and the ISGS undoubtedly has its drilling record. Orders are phoned, faxed, mailed, or walked into the Survey. Tonia Vaughn, on the Geological Records team, makes sure they get good copies of the drilling or electric logs. "A customer called yesterday at 4:30," Tonia says. "He wanted me to FedEx copies of 12 electric logs." A medium-sized log is equivalent to 50 sheets of paper, so by the time she ran them through the copier, the FedEx pickup had come and gone. It was also time for Tonia to go home, but on her way, she stopped at the FedEx office. Her customer had the geologic information in his hands by the next morning.

17, 1994, attracted 129 people, including 24 teachers and 13 students. Along the way, the field trip leaders shared information on the geology and historical development of the zinc–lead deposits of northwestern Illinois, and reviewed the geologic history of the Apple River—one of the major drainage systems in the area. Other highlights of the trip were visits to an abandoned lead mine and a limestone quarry where the participants collected mineral specimens and fossils.

The second trip on October 8, 1994, was held in the Casey–Martinsville area of Clark and Cumberland counties in east-central Illinois and attracted an enthusiastic crowd of 103 people, including 16 teachers and 20 students. The trip included visits to an abandoned "oil mine" in the Siggins Oil Field, the Marathon Pipe Line Company transmission and storage facility, and the Martinsville Oil Field. Another highlight of the trip was a visit to a limestone quarry where rocks of Pennsylvanian age were exposed, allowing an opportunity to collect fossils.

The third field trip, held in the vicinity of Salem in Marion County in the northern part of southern Illinois on April 22, 1995, attracted 101 people, including 12 teachers and 27 students. The participants were made acquainted with the geology of the Pennsylvanian bedrock, the glacial history of the area, and the geologic and engineering aspects of oil exploration and production development of the Salem Oil Field in Marion County.

In the Pekin area of Tazewell County in central Illinois on May 20, 1994, the final field trip of the season attracted 181 participants including 21 teachers and 39 students. Highlights of the trip included a scenic view of the Illinois River where the group learned about the geologic history of the Illinois River valley, and visits to two sand and gravel pits where a large variety of rocks and minerals could be collected. The two field trips held this spring attracted a total of 133 first-time participants.

The geological science field trip program is designed for school teachers and the general public. The guidebooks for each trip are distributed free to people on the trip and are later available for a modest charge. These guidebooks may be useful for teachers conducting their own local trips. During the report period, 460 guidebooks were sold to the public.

Workshops and Exhibits The staff of the Educational Extension Unit represented the ISGS at the annual Coal Awareness Celebrations in Springfield on September 27–30, and in DuQuoin on October 18. Over 8,000 students visited our displays, which included samples of the successive ranks of coal, a presentation on the geology of coal deposition, and a model representing one ton of coal.

In addition, the Educational Extension Unit participated with the Natural History Survey in conducting the following Biodiversity Exhibits and Workshops: Gilberts Environmental League in Kane County, Lundahl Jr. HS in Crystal Lake, Greenville Elem. School in Bond County, and the Kane County Forest Preserve district. The unit also presented workshops on Topographic Maps, and Rock and Mineral Identification, and an exhibit of educational materials at the Illinois Science Teachers Association Annual Meeting in St. Charles on November 3–5, 1994. We also participated in the Clean Water Celebration in Peoria on March 20, 1995, where a demonstration on Glacial Geology and Geomorphology was presented.

Public Service In response to a continuing demand, the Education Extension Unit distributed more than 500 copies of "Resources for Teaching Geology." This catalog lists the ISGS publications most suitable for use in the classroom and is supplied to educators interested in obtaining information on the geology of Illinois. During this report period, the Educational Extension staff prepared 250 letters in response to requests for educational materials, and supplied 113 rock and mineral sets to educational institutions in Illinois.

Geological Records and Samples

Geological Records Library The repository for drilling records in Illinois, as mandated by statute (Illinois Oil and Gas Act-225 Illinois Compiled Statutes 725/6(4), is the ISGS Geological Records Library (GRL). The records come from oil and gas wells, water wells, engineering borings, and other miscellaneous test holes drilled throughout the state. The database represents billions of dollars invested in drilling in Illinois for exploration and development of mineral fuels and groundwater, and for construction engineering. The oil industry, coal industry, hydrogeologists, engineers, land-use planners, academic researchers, landowners, the general public, and the ISGS staff find the database a valuable resource.

Since November 1988, the GRL staff has been working on reducing the backlog of water well permits and logs to be added to the ISGS database. The backlog of records to be entered has averaged 5,000 records per month. During December 1994, the water well data-entry team completed entering the backlog of matched permits and logs, and the data set is now current. Since the catch-up program began, the GRL staff has entered a cumulative 86,916 water well permits and logs to the database. These additions to the computerized database, when combined with the results of a related data-entry project supported by the Low-Level Radioactive Waste project, will provide a high-quality, current database to meet the needs of the citizens of Illinois, the ISGS research staff, and industry.

The Illinois Department of Mines and Minerals (IDMM) has undertaken a project to add information from all plugged wells in Illinois to their database. As their staff proceeds with this project, they send copies of the plugging affidavits to the GRL to check against our records. This step is carried out under an agreement between our two agencies to move toward a more uniform well information database. During the past report period, the GRL received 41,344 plugging affidavit forms from IDMM. This increase is reflected in the annual statistics of the GRL (table 2). Delivery of these items is creating a new backlog of unprocessed documents.

Acquisition of well information continues (table 2). Demand for GRL services remains high, as shown by the count of mail processed and number of phone calls received. Note the 119% increase in mail received. This increase reflects the large increase in the number of plugging affidavits received from IDMM. The number of visitors using the records Library increased, although the number of files used by visitors and staff decreased slightly. The number of continuous logs and copies of single sheets distributed also increased.

The ISGS recently purchased a state-of-the-art continuous document copy machine to reproduce copies of well logs on file in GRL.

Table 2 Annual statistics of the Geological Records Unit

	1993–94	1994–95
Service Activities		
Total mail processed	29,530	64,714
Visitor days	818	993
Files used by public and staff	31,669	36,101
Phone calls	3,483	3,537
Copies		
continuous logs	3,867	4,665
single sheets	49,182	50,222
Total orders processed	1,751	1,799
Copies to state agencies/staff		
single sheets	3,389	4,302
logs	414	504
Data Acquisition		
Basic Data		
Oil permits	816	763
Water permits	7,515	7,955
Water Task Force records	9,332	9,955
Plugging affidavits		
oil	8,130	41,344
water	2,365	2,894
Logs		
Electric logs	354	292
Micro logs	153	127
Radioactivity logs	447	415
Miscellaneous geophysical logs	90	102
Subtotal geophysical logs	1,044	936
Drilling logs	63	25
Drilling time logs	139	111
Company sample and core studies	28	30
Geologic tops	105	97
General data (completion data)	1,375	1,495
Water well and test hole logs	6,884	7,936
Miscellaneous	415	182
Total new logs received	10,053	10,812
Cumulative Totals through June 30, 1995		
Collections	**FY 1995**	**Total**
Processed drill-hole records	10,906	371,041
Books of processed drill-hole records	8	1,050
Skeleton logs (records prior to 1920)		17,920
Books of skeleton logs		40
Books of confidential logs		15
Books of out-of-state logs		14
Books of miscellaneous drill-hole records		9
Geophysical logs	1,273	135,910
Coal plugging	458	24,791

Table 3 Final publication projects [a]

	1991–92	*1992–93*	*1993–94*	*1994–95*
Bulletins	1	2	0	0
Circulars	2	3	3	0
Environmental Geology series	4	1	2	2
Cooperative Groundwater Reports	3	0	0	1
Illinois Mineral series	2	2	1	1
Illinois Petroleum series	2	3	4	5
Illinois Mine Subsidence Research (limited series)	0	0	1	3
Special Report (new series)	1	0	1	0
Guidebook series	1	0	1	0
Open File Series (including computer maps)	22	30	4	8
Illinois Scientific Survey Joint Reports	0	0	0	0
Educational Extension field trip guides	4	4	4	4
Papers, book chapters, misc. text (more than 5 pages)	15	18	10	7
Geogram	0	1	0	0
Large format maps, cross sections, stratigraphic columns	16	7	2	5 [b]
Posters, displays, major slide presentations	21	27	29	25
Administrative, miscellaneous, and *Geonews*	5	6	5	5 [c]
Mega-reports: GSA memoir 188 and USDOE final report				2

[a] tally of completed projects (published or unpublished), which are not all equal in size and complexity.

[b] includes cross sections for IP 149, 11:30 cross section of Illinois Basin, and Peppers GSA plate, as well as computer-generated Illinois Maps 4 and 5, which required considerable graphics and editing by Pubs staff.

[c] includes annual report with annexes, GSL catalog, photo book of ISGS staff, and two *Geonews*.

Providing copies of continuous logs is one of the essential services provided by the Survey to the citizens and industries of Illinois.

Geological Samples Library One of the largest geological samples collections in the United States is housed in the ISGS Geological Samples Library (GSL). Mandated by statute (Illinois Oil and Gas Act-225 Illinois Compiled Statutes 725/6(4), this remarkable repository holds rock cores and samples of drill cuttings that represent billions of dollars invested in drilling in Illinois by petroleum, mining, and engineering companies. The collection attracts users from across the country, thus increasing the potential for investment in Illinois. It also provides an essential material database for investigating environmental and resource issues.

Visitors and staff members referred to GSL files 173 times and studied 554 sets of samples or core during FY 1995. Visitors to the Annex facility represent a wide range of interests, including independent consultants, major oil companies, universities, and government agencies. Of the 60 different people who visited the GSL, 37% were from out-of-state, 17% were independent oil operators, and 80% represented other companies, governmental organizations, or universities.

During FY 1995, 162 sets of well cuttings from 85 oil tests and 77 water wells were added to the permanent file. The additions, which represent 310,881 feet of drilling, increased the total drilling footage represented by the collections to 744,254,755 feet. The GSL files of 68,148 sets of well cuttings are stored in 110,341 boxes. Samples from an additional 61 oil and water wells currently await processing.

Rock cores from oil and mineral borings increased the total drilled footage of core to 1,308,014 feet. During the report period, 164 rock cores representing an additional 216,538 feet of drilling were collected, examined, and processed into the permanent files, which now include 14,059 sets of core.

Publications, Graphics, and Photography

The scientists of the ISGS are known for the high quality of their reports, papers, maps, posters, and slide talks (table 3). The editorial, graphic, and photographic services (table 4) provided by the ISGS Publications Unit help researchers communicate clearly and effectively with the scientific and business communities, other government agencies, and the general public. The Publications Unit also

Table 4 Graphics* and photographics

	1992-93	*1993-94*	*1994–95*
Assorted maps, cross sections, graphs, layouts	523	645	435
Graphics for ISGS publications*	664	509	578
Large format graphics (only 60- to 150-hr items)	6	–	3
Design, format, assemble books (includes work taken over from typographer)			
■ artists	16	19	24
■ editor	4	2	1
Photography for staff (about 25% of the black/white shots are printed; all negatives are filed)			
■ field	6,120	6,912	7,301
■ lab	864	1,260	3,836
■ studio	855	1,296	1,814
■ total	7,839	9,468	12,951
2×2 inch slides (not only flat art, but also specimens)			
■ total	5,542	5,053	5,016
Negatives for print plates (9×12 or 12×18 in.)	649	745	406
PMT prints developed for staff, total	1,516	1,223	1,140
■ screened	413	348	333
■ line (reverse and acetate)	1,103	875	807
Prints (total reflects 2–3 prints made of each selected exposure)			
■ photographic	3,033	2,855	1,591
■ contact prints	346	166	413
■ contact sheets	288	258	175
■ total	3,667	3,279	2,179

* artists design, create layouts, and paste up publications—work that cannot be fully reflected in these numbers of illustrations.

promotes the fine work performed at the ISGS by writing and producing the Survey's newsletter, *GeoNews*.

Attention to detail is what geologist Brian Trask expects and what he gets when he brings his poster text and illustrations to the Pubs Unit. Technical artist Jackie Hannah (right) calls in editor Anne Latimer to check the map legends.

Microcomputer Services

Microcomputers (PCs), an important tool for every member of the ISGS, are used in tasks ranging from collecting raw data in the field to printing the final report. To ensure the efficient use of these computers, the ISGS Special Services Unit responds to questions about hardware and software operation, assists with problems concerning the purchasing and installing of equipment, recommends appropriate software and hardware to accomplish tasks, and repairs computers, printers, and other electronic equipment. A new staff member was added to the Special Services Unit this year, and the additional manpower has proved invaluable during the recent computer network upgrade. While the University of Illinois changed the building's network wiring, the Special Services Unit replaced network cabling, network cards, and e-mail software for all microcomputers in the building. This project, which was finished in 7 days with no problems, now gives everyone at the ISGS access to network services such as e-mail and Internet.

Photodocumentation of ISGS research is a big part of Joel Dexter's job. Here the Survey's photographer is 200 feet underground in the deep tunnel bored for the Metropolitan Water Reclamation District of Greater Chicago.

Nancy Martinkus (seated) and Yan Liu handle contract accounts in the Business and Financial Services Unit. Martinkus, working on a major close-out, is paying close attention to the fine print in the key contracts. "We have to make sure no rules are broken." Liu is saving someone a lot of irritation by "chasing a product ordered for his lab. UPS says they shipped 10 days ago, but we never got it. Then the wrong item arrived, but the University had already paid." She warms up, "So I got on the phone...." It's a long story with a happy ending.

Maintenance, Operations, and Design

A woodworking shop, metal and machine shop, electronics shop, and automotive section, plus a drill rig and operator, provide special services to the ISGS scientific and support staff. Our versatile craftsmen design, construct, maintain, and repair equipment and instruments, as well as schedule and maintain the ISGS automotive and special vehicle fleet. They are also responsible for the general upkeep of the Survey's buildings. During the reporting period, 192 internal work orders and 266 verbal requests were completed, requiring repairs, fabrication, moving, maintenance, and other services.

As work proceeded on the project to upgrade the Natural Resources Building, the Maintenance, Operations, and Design staff moved and relocated staff members in the Natural Resources Building to make way for the construction. They also relocated staff members from the Applied Research Laboratory to the Natural Resources Building to facilitate the remodeling at that building, including the set-up and reconnection of some lab equipment so that research could continue.

Custom-designed computer workstations, tables, desk organizers, bookshelves, and map cases are a specialty of the woodworking shop. The staff constructed book shelf units for the Savoy office, specially designed desk organizers for the secretaries in the Chief's office, and special workstations to maximize the use of minimal space in the Geological Records Unit. They also constructed clear plexiglass tube racks, a special carrying case for the dissolved oxygen cell, special holders for sample bottles, and many other items. The staff also painted file cabinets and repaired coat racks, chairs, and other wood furniture.

The machine shop staff routinely designs and constructs special apparatus not available through any commercial source. During the report period, they constructed a special stand to transport and safely pour liquid nitrogen from a large dewer. Also of note was the fabrication and assembly of a flowthrough cell for a dissolved oxygen probe. The staff of the unit received special recognition from the Geochemistry Section for their assistance in the mechanical fabrication of special equipment needed to construct the Low Level Tritium Analysis System. To assist the project on fate and transport of pesticides in geological materials, they constructed a metal frame and canvas structure, 38 feet square, which acts as a rain exclusion shelter. Design and construction of a container to be used for the extraction of dissolved gases from water samples collected in the field was also a challenging project.

The electronics shop provides support in electrical/electronic maintenance and repair of scientific equipment and coordinates site preparation for new equipment installations throughout the ISGS. Repairs to the high power voltage stabilizer, used as the main power supply for the Nuclide Isotope Ratio Mass-Spectrometer, saved approximately

Servicing the 28 ISGS and 78 Natural History Survey vehicles is mainly Steve Wildman's responsibility, but everybody in the Maintenance, Operations, and Design Section pitches in when things get hectic.

$7,000 dollars and kept an aging, vacuum tube instrument online. The staff also installed remote switches for the Haskins cooling system and the microprocessor on the Scintag X-Ray Unit to make turning off these instruments easier and safer for staff because of the tight quarters in this laboratory.

The ISGS drill rig and operator in support of our scientific staff worked on eight projects for a total of 41 days in the field during this report period. Projects included continuous sampling and monitoring well installations for proposed wetland mitigation, core drilling in Carroll County for geologic mapping, and drilling and continuous sampling at the Golden Cat Clay Pit at Olmstead, Illinois. The drill rig operator works closely with ISGS staff to effectively complete their research projects and performs all drill rig maintenance along with other unit assignments.

Servicing and keeping records on the 28 ISGS and 78 Natural History Survey vehicles is the responsibility of the automotive section, which also handles dispatching and new vehicle requisitioning for ISGS vehicles. This year, 185 vehicle lube and oil changes were completed and 123 vehicles were cleaned in the garage. In addition to routine fueling, window and interior cleaning, and tire changing, the staff also installs trailer hitches and mud guards, and oversees vehicles taken to the State garage for major repairs. The automotive unit specified and requisitioned three new vehicles for the ISGS fleet. Operational costs for the ISGS fleet this year were a very low 12.1 cents per mile. Following a strict maintenance schedule has kept costs to a minimum. The automotive unit staff also repairs portable gas generators and other gasoline and diesel-powered equipment used in the field. This year the staff spent many hours on motor installation and preparation of the Boston Whaler boat to be used for bathymetric profiling to monitor coastal changes on Lake Michigan.

The Machine Shop at the Applied Research Laboratory completed work for the hydrated lime, coal pelletization, and several other miscellaneous projects. It also played a major role in the remodeling of the building, a capital project that began in February 1995.

Capital Development Board Projects

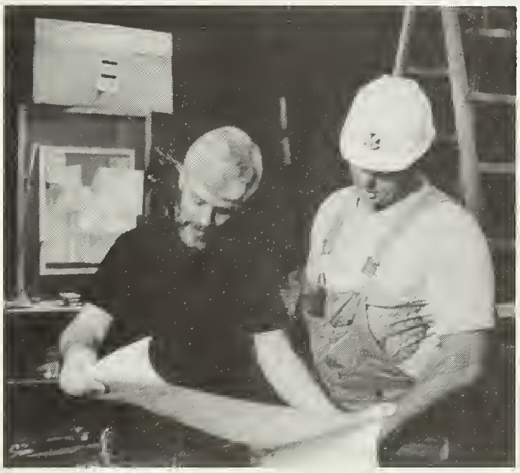
Phase I of the $3.44 million Natural Resources Building renovation has been completed. Change-order work on Phase II continues.

Major work on the $933,000 Applied Research Lab safety upgrade has been completed and change-order work is underway. Funds remaining in the project will be utilized in a bid for chimney repairs. Three of the four chimneys at the Applied Research Laboratory are crumbling and constitute a severe safety hazard. The chimney bid and work should begin during the late summer or early fall.

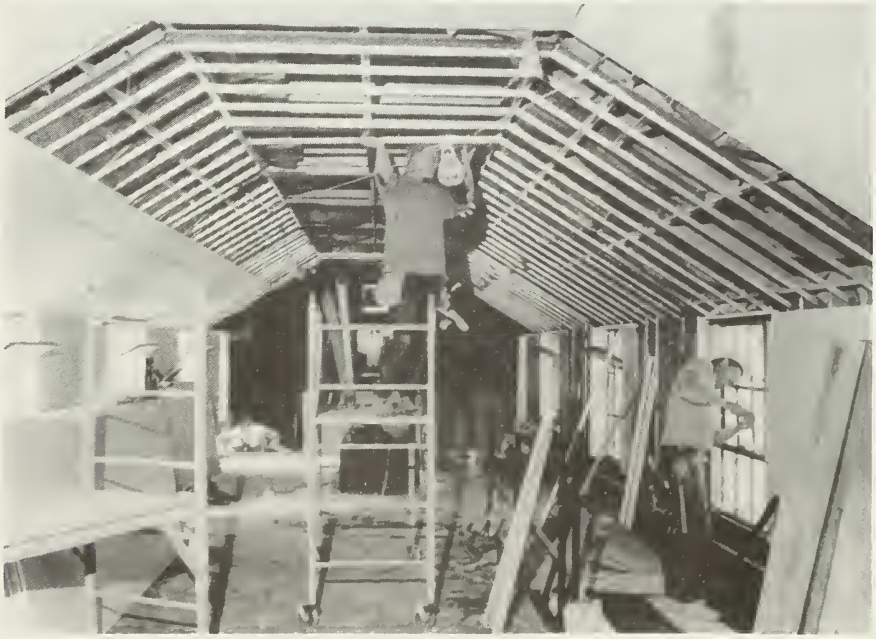
The Americans with Disabilities Act (ADA) Compliance Plan remodeling project has begun and is proceeding at a pace that is slower than anticipated.

The FY 1996 Capital Budget appropriation was not passed during the spring legislative session. The Capital Budget may be a topic for the fall veto session.

The FY 1997 Capital Budget submission to the DNR Central Office included a request for an addition to the Core Samples Library and a request for planning money to convert the Natural Resources Building for the sole use of the Illinois State Geological Survey.



Jimmie Cooper, resident craftsman at the ISGS Applied Research Laboratory, and an electrician look over the plans for renovation of a first floor room to be shared by chemists Joe DeBarr and Gwen Donnals. "I've been here 26 years," says Cooper, who's worked on every phase of the construction. "I know the building."



Insulation and double drywall improve the third floor storeroom 100%.

ACTIVITY MEASURES

All Illinois state agencies are required to provide activity measures as part of their annual budget presentations to the General Assembly. The ISGS uses a wide range of activity measures to gauge our effectiveness in reaching the public with our information and services (table 5). The measures are also helpful for indicating where research and service staff are applying their greatest energies, and whether we may need to adjust or reshape our program, budget, or organization.

Some of our annual measures are calculated from samples for selected months; for example, the number of long-distance telephone calls made by the staff was projected from the number of calls billed to the ISGS during July and October 1994, and January and April 1995. Other measures are based on summations of counts provided by each member of our staff. Despite some variations in their accuracy, we think that changes in these measures from year to year reflect real trends whose causes need to be analyzed and understood.

Table 5 Selected activity measures, 1994–95

	Energy and Mineral Resources	Geo-chemistry	Geologic Mapping and Framework	Groundwater and Environmental	Technical and Administrative Services	Total FY 95	Total FY 94
Reports and Maps							
published	122	30	50	58	8	268	312
distributed						16,645	25,440
Active projects	86	26	39	58	7	216	190
Visitors and office conferences	282	78	141	203	2,664	3,368	3,296
Letters and unpublished reports	543	32	197	766	404	1,942	1,640

Research Activities

The ISGS's scientists and support staff reported 122 state-funded research and service projects in progress during the fiscal year—34 more than the 88 reported last year. Of these, 49 were in the area of Energy and Mineral Resources (up 17), 18 in Geochemistry (unchanged), 25 in Geologic Mapping and Framework Studies (up 5), 24 in Groundwater and Environmental Geology (up 12) and 6 in Technical and Administrative Services (unchanged). The Contracts and Grants Office reported 94 active, sponsored research and service projects, a decrease of 8 more projects from FY 94. Of the 94 projects, 37 were in the area of Energy and Mineral Resources (down 4), 8 in Geochemistry (down 2), 14 in Geologic Mapping and Framework Studies (unchanged), 34 in Groundwater and Environmental Geology (down 2), and 1 in Technical and Administrative Services (unchanged). The number of active state-supported projects reported by our scientists is up by 39% compared to last year whereas the number of sponsored projects is down by almost 8%. The large increase in the number of state-funded research and service projects compared to last year represents a major reversal of the trend for the past several years and may reflect the staff's renewed confidence in the future as a result of the recent stability of our state appropriations.

According to the count maintained by our grants and contracts administrative office, ISGS scientists submitted 57 proposals for external support of research investigations, 5 fewer than last year. Of these, 27 were submitted in the Energy and Mineral Resources area, 8 in Geochemistry, 8 in Geologic Mapping and Framework Studies, and 14 in Groundwater and Environmental Geology. Many of the proposals we submit are prepared at the request of the sponsoring agency after preliminary negotiations have been completed. Of the 57 proposals submitted in FY 95, 30 were accepted by the sponsor and at least partially funded, 13 were rejected by the sponsor or withdrawn by the ISGS, and 14 were still pending at the close of the fiscal year. This represents a success ratio of about 53% for the proposals on which a decision had been made by the sponsor, down slightly compared to last year. Our transition into the new Department of Natural Resources delayed the approvals for some sponsored project proposals until after the start of the new fiscal year. Thus, the slight dip in our success ratio for FY 95 probably is of no significance.

To transfer the results of our investigations and service activities to the users, ISGS scientists prepare numerous reports, maps, and other documents for publication in our own series or in scientific and trade journals, proceedings volumes, and guidebooks compiled for scientific meetings. The authors and titles of these formally published documents are listed in the *Publications* section of the annual report. The number of publications prepared this year, as shown in table 3, decreased by 14% over the number published last year. Of these publications, 157 appeared in external journals and 111 in our own series. The area of Energy and Mineral Resources research and service accounted for 122 (63 external and 59 internal); Geochemistry accounted for 30 (23 external and 7 internal), Groundwater and Environmental Geology accounted for 58, (30 external and 28 internal), Geologic Mapping and Framework Studies added 50 (41 external and 9 internal), and Technical and Administrative Services produced 8 internal publications.

Information Responses

To provide scientific information to those requesting it, the ISGS Library and Information Office sold 5,740 copies of our books and pamphlets and 4,037 copies of our maps and cross sections. We also distributed 6,465 free copies of our books and 403 free copies of ISGS map products. The total of 16,645 document copies distributed is 34% fewer than last year's total. The number of books and pamphlets distributed free fell by 40% compared with last year, but the number of map products distributed free rose by about 3%. The number of books and pamphlets sold fell 20%, and sales of our maps and cross sections fell about 41%. We sold 16,645 copies of United States Geological Survey map products and distributed 3,983 free copies. The number of USGS maps sold this year is almost 9% less than last year, but the number of free copies distributed is 4% more than last year. According to the Information Office staff, requirements by environmental regulatory agencies that USGS topographic maps and one of our Circulars (532) be used in carrying out certain regulatory mandates have helped to sustain our publication sales at comparatively high levels. Requests for these publications have fallen off because the demand apparently has been met. This year, 2,354 reference requests were made to the Library/Map room, an increase of nearly 600 over last year.

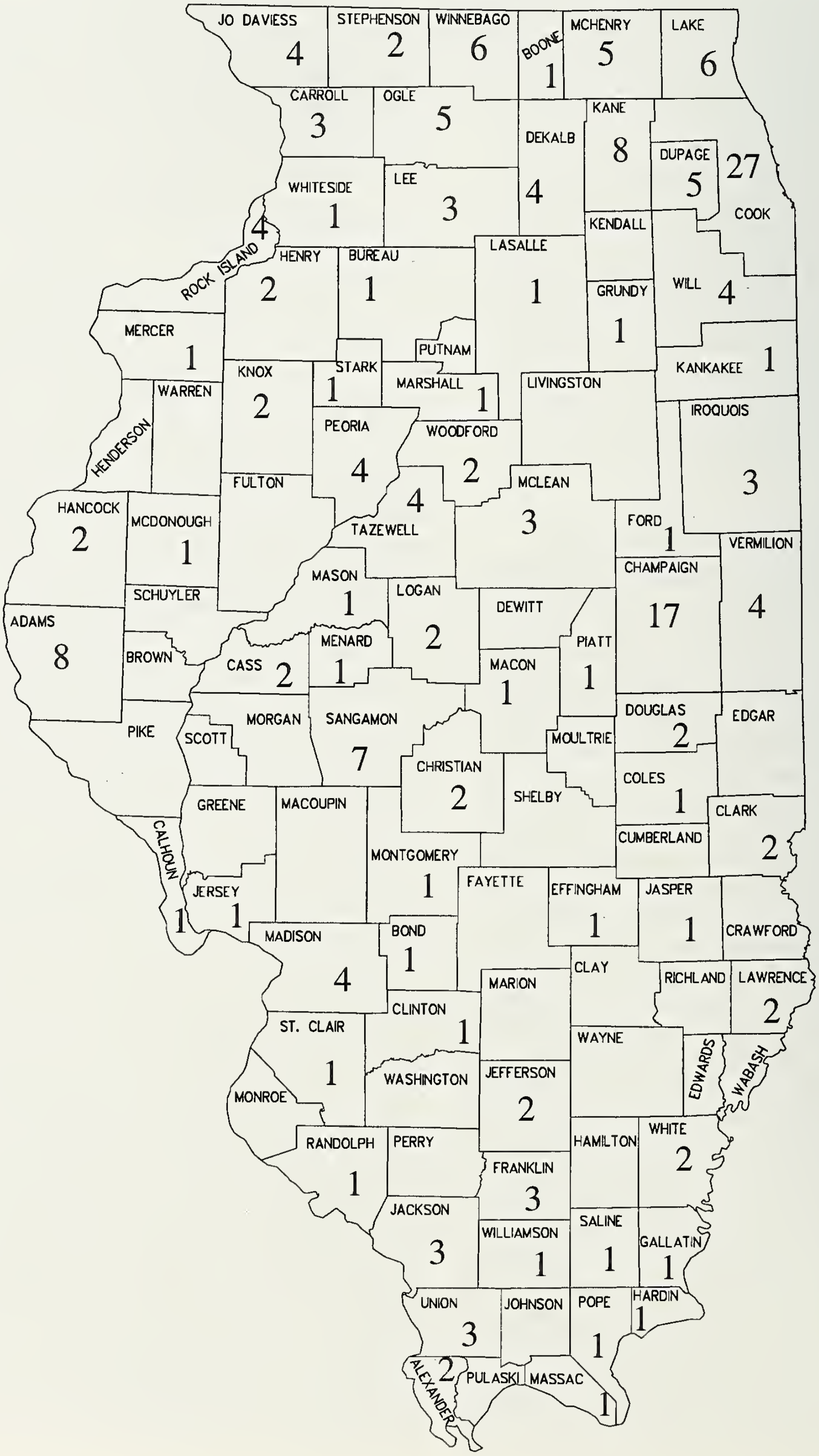
During the reporting period, at least 3,368 visitors came to the Geological Survey's offices and laboratories to seek scientific advice, discuss proposed activities, examine our voluminous files of scientific data, and purchase copies of publications. The total is about 2% greater than the number of visitors for FY 94 as shown in table 5. The total number of visitors to the Information Office was 1,613 in FY 95, compared to 1,619 last year. In FY 95, 993 visitors came to the Geological Records Library, up from 818 in FY 94, and 58 public visitors came to the Geological Samples Library in FY 95 compared to 79 in FY 94. Visitors to the Samples Library, both staff members and the public, examined 554 sets of samples, up by 32% from last year, continuing a sharp upward trend in this statistical measure.

To respond to inquiries and conduct Survey business, our scientists reported sending out 1,942 letters and unpublished reports, about 300 more than last year. An estimated 32,880 long distance telephone calls were billed to the Survey for the year, about 400 fewer than last year. The Information Office received 9,383 incoming phone calls in FY 95, down almost 18% from last year's total. Many of these incoming calls are directed to our scientists to respond to requests for specific geologic information.

Telephone calls, facsimiles of hand-written and typed materials, and computer e-mail messages and other data transmitted directly through the Internet worldwide computer network are rapidly becoming the preferred means of transferring information to our clients. Statistics on use of the ISGS home page for the Worldwide Web reflect the growing importance of this new medium for technology transfer. From January through June of this year, users selected a document on the ISGS home page 13,833 times, an average of 2,305 times per month. The ISGS server connected with a total of 1,689 different computers during the 6-month period (an approximation of the number of individual people who contacted us), an average of 281 computers per month or approximately 10 per day. The nearly 14,000 readers of documents included 5,302 educational institutions, 2,444 commercial online services, 925 government agencies, 315 unclassified U.S., 134 organizations, and 106 U.S. military. Inquiries came from 29 foreign countries. On our home page, you may now click on the outline of a county to obtain a list of pertinent ISGS publications. The map (right) shows the number of times a user requested this listing for a county. The service has been available for all 102 counties only since June 1, 1995.

Demand for copies of well logs and other records distributed by our Geological Records Library (GRL) increased from last year. The GRL sold 4,665 continuous well log copies, 798 more than last year; distributed 504 free well log copies; sold 50,222 single-page copies of geological records (mostly water well logs); and distributed 4,302 for free (54,524 total). A total of 36,101 files were used in the Geological Records Library this year.

The Educational Extension Unit hosted 587 persons on the four geology field trips offered this year, of whom 18% were students and their teachers. This year 72 rock and mineral sets



were distributed, and there were 250 other responses for educational materials. The staff of the unit presented 21 teacher workshops.

Exhibits and displays about the ISGS and its programs were mounted this year at the Nature of Illinois Foundation's Awards Luncheon, the tour of the Surveys by legislators and their staffs, the 1994 State Fair, and at two meetings of county officials. Members of the ISGS staff had contacts with the press on at least 46 occasions.

Identifications and Analyses

To carry out their research and service projects during the reporting year, ISGS chemists completed at least 28,847 separate elemental determinations on 1,068 samples of rock, soil, brine, and water. The chemists also ran 17,263 analyses on 661 coal samples. Chemists made 4,880 capillary gas chromatography determinations on 506 samples, and made 47,506 GC-MS determinations on 326 samples. The Isotope Geochemistry Laboratory performed 2,722 separate isotopic determinations on 1,584 samples, completed 244 carbon-14 age determinations, and ran determinations for tritium on 20 water samples. The Coal Analysis Laboratory completed 950 proximate, ultimate, hydrogen, sulfur, and carbon analyses on 330 samples of coal and coal-related materials. They also completed 40 particle size determinations on 20 samples and 60 determinations of fluorine and chlorine in 30 samples. Operations of the Coal Analysis Laboratory were significantly disrupted this year by the need to move out of the Applied Research Laboratory building during the extensive remodelling and safety upgrade. The Environmental Geology Laboratory made immunoassay determinations for pesticides in 601 samples. Tritium was determined by scintillation counter in 226 samples. Ion chromatography was used to determine nitrate in 606 samples and 5 other species in 442 samples. The alkalinity of 36 water samples was also determined. Other chemical determinations included 28 determinations of bicarbonate ion and dissolved gases, 34 organic sulfur determinations, 9 determinations of forms of sulfur, and 5 sulfate extraction tests. Our scientists also completed 3,500 mineralogical determinations by x-ray diffraction, described 105 petrographic thin sections, processed 42 samples of coal through the low-temperature ashing systems, ran 8 tube furnace tests, 71 temperature-programmed desorption tests, 167 thermogravimetric analyses, and 58 determinations of surface area. The scanning electron microscope with energy-dispersive x-ray fluorescence detector was used to make 194 determinations on 84 samples.

In the field and laboratory, our scientists measured 162 stratigraphic sections, described 156 cores, and studied 291 sample sets. Hand specimen identifications for others totaled 248. The palynology laboratory completed 32 biostratigraphic determinations on 57 samples. Geotechnical analyses included 96 hydrometer tests, 345 sieve tests, 156 determinations of total suspended sediment content, 32 double-ring infiltrometer tests, 63 Guelph permeameter tests, and 77 tensiometer measurements.

The reservoir engineering laboratory completed measurements of porosity and permeability on 25 core plugs, 100 minipermeameter measurements, 5 coreflow tests, 15 oil viscosity tests, 15 brine viscosity tests, 20 resistivity measurements, 5 pilot-tube gas flow tests, 2 isochronal gas flow measurements, and collected 12 gas samples for chromatographic analysis.

To explore for groundwater and for other purposes, our scientists ran 50 borehole geophysical logs. They also conducted 54 electrical earth resistivity surveys. There were 2 seismic surveys conducted. The staff of the Digital Cartography and Spatial Analysis Section and other staff members throughout the ISGS wrote 325 custom computer programs in various languages, completed 7 data-entry projects of various sizes, digitized 321 maps, plotted 1,689 copies of various digital map files for internal use or external distribution, and sold 43 electronic data sets.

FINANCIAL REPORT

Appropriated Funds

Out of the total appropriations for FY 1995, (General Revenue Fund — $5,653,000; Natural Resources Information Fund — $250,400; and Hazardous Waste Research Fund — $141,100), expenditures from the General Revenue Fund (Table F1) were approximately 99.96% of the amount available. The Geological Survey suffered from shortfalls in the Medicare, Contractual Services, Telecommunications, and Operation of Automotive Equipment lines. These shortfalls were caused by increased costs for new staff members subject to Medicare, extra expenses related to the search for a new Chief and for other positions, and increased costs for Telecommunications and Operation of Automotive Equipment without any offsetting increases in the appropriations for these lines. These shortfalls were covered both by transfers from other General Revenue operating lines and, where appropriate and necessary, by paying for these costs from funds administered by the University of Illinois. The actual shortfall in the Operation of Automotive Equipment line is not fully reflected by the amount transferred among the operating lines within the GRF appropriation. These additional costs were covered from funds administered by the University of Illinois. Approximately $2,000 was lapsed in all GRF lines. Most of this lapse occurred in the Repair & Maintenance-Building line as a result of the University of Illinois' having significantly overestimated some building repair costs. Other minimal amounts were lapsed in the Contractual Services and Geomapping lines. Expenditures from the Natural Resources Information Fund (Table F2) were only approximately 68 percent of the appropriation because receipts into the fund from publication sales were lower than the full appropriation amount. Since receipts exceeded expenditures by about $11,000, the surplus in the fund grew slightly this year. Approximately 99.8% of the appropriation for the Groundwater Protection Act (Hazardous Waste Research Fund, Table F3) was expended, lapsing approximately $300.

Table F1 FY95 Financial Statement for the Illinois State Geological Survey General Revenue Fund: July 1, 1994, to September 30, 1995 ($ in thousands)

Line item	Original appropriation for FY95	Transfers	Vouchered to date	Outstanding obligations to date	Balance available for FY95
Personal services	$4,782.4	$0.0	$4,782.4	$0.0	$0.0
Retirement contributions	256.6	0.0	256.6	0.0	0.0
Social Security contributions	9.0	5.0	14.0	0.0	0.0
Contractual services	90.2	4.2	94.1	0.0	0.3
Topomapping	17.4	0.0	17.4	0.0	0.0
Travel	35.7	(6.1)	29.6	0.0	0.0
Commodities	63.2	(14.0)	49.2	0.0	0.0
Printing	32.9	(0.3)	32.6	0.0	0.0
Equipment	34.7	(0.3)	34.4	0.0	0.0
Computer based research	47.9	(0.8)	47.1	0.0	0.0
Telecommunications	48.7	13.0	61.7	0.0	0.0
Operation of automotive equipment	31.6	1.1	32.7	0.0	0.0
GeoMapping - other expenses	22.5	0.0	22.4	0.0	0.1
Water inventory & aquifer assess.	85.5	0.0	85.5	0.0	0.0
Repair & maintenance - major equip.	78.4	(1.8)	76.6	0.0	0.0
Repair & maintenance - building	16.3	0.0	14.7	0.0	1.6
TOTALS	$5,653.0	$0.0	$5,651.0	$0.0	$ 2.0

Allocated Funds

Of the FY95 funds available for the Lands Unsuitable for Mining Program, vouchered expenditures were approximately 100% of the available allocation (Table F4).

University-Administered Funds

Of the budgeted FY 1995 funds generated from indirect cost recovery from sponsored research projects, the actual vouchered expenditures were 82% of the Board-approved allocations (Table F5). The Geological Survey had to spend more than the budgeted amounts from the contractual services and equipment lines due to extra relocation and equipment costs for the new Chief, and the need for some temporary help. Although some transfers among budget lines were necessary, the planned total expenditure was not exceeded. In fact, the significant carryover from the FY 95 budget has entirely eliminated the deficit in the account that existed at the beginning of FY 1995.

Table F2 FY95 Financial Statement for the Illinois State Geological Survey Natural Resources Information Fund: July 1, 1994, to September 30, 1995 ($ in thousands)

Line item	Original appropriation for FY95	Vouchered to date	Outstanding obligations to date	Balance*
Lump sum - operating expenses	$249.4	$171.0	$0.0	$78.4
Refunds	1.0	0.1	0.0	0.9
TOTALS	$250.4	$171.1	$0.0	$79.3

*NRIF receipts are insufficient to expend the full appropriation amount
NRIF Receipts July 1, 1994 through March 31, 1995 were $182.3

Table F3 FY95 Financial Statement for the Illinois State Geological Survey Groundwater Protection Act (Hazardous Waste Research Fund) July 1, 1994 to September 30, 1995 ($ in thousands)

Line item	Available appropriation for FY95	Vouchered to date	Outstanding obligations to date	Balance available for FY95
Lump sum	$141.1	$140.8	$0.0	$0.3
TOTALS	$141.1	$140.8	$0.0	$0.3

Table F4 FY95 Financial Statement for the Illinois State Geological Survey Lands Unsuitable for Mining Program: July 1, 1994, to September 30, 1995 ($ in thousands)

Line item	Available appropriation for FY95	Vouchered to date	Outstanding obligations to date	Balance available for FY95
PROGRAM				
Personal services	$60.1	$60.1	$0.0	$0.0
Social Security contributions	0.3	0.3	0.0	0.0
Group insurance	6.2	6.2	0.0	0.0
Contractual services	0.0	0.0	0.0	0.0
Travel	1.1	1.1	0.0	0.0
Computer based research	29.6	29.6	0.0	0.0
Telecommunications	0.3	0.3	0.0	0.0
Program totals	97.6	97.6	0.00	0.00
ADMINISTRATION				
Personal services	$12.3	$12.3	$0.0	$0.0
Retirement	0.0	0.0	0.0	0.0
Social Security contributions	0.2	0.2	0.0	0.0
Group insurance	1.8	1.8	0.0	0.0
Commodities	0.5	0.5	0.0	0.0
Telecommunications	0.0	0.0	0.0	0.0
Administration totals	14.8	14.8	0.0	0.0
GRAND TOTALS	$112.4	$112.4	$0.0	$0.0

Table F5 FY95 Financial Statement for the Illinois State Geological Survey Indirect Cost Recovery Fund: July 1, 1994, to June 30, 1995 ($ in thousands)

Line item	Approved allocation for FY95	Transfers	Vouchered to date	Outstanding obligations to date	Balance available for FY95
Personal services	$57.8	($24.4)	$27.2	$0.0	$6.2
Benefits	13.1	(0.6)	4.7	0.0	7.8
Retirement lump sums	23.5	0.0	23.5	0.0	0.0
Contractual services	28.0	21.0	33.3	0.0	15.7
Travel	15.0	(0.7)	10.9	0.0	3.4
Commodities	1.0	0.0	0.6	0.0	0.4
Printing	0.0	0.0	0.0	0.0	0.0
Equipment	12.7	4.7	16.6	0.0	0.8
Telecommunications	0.5	0.0	0.1	0.0	0.4
Allocations	71.4	0.0	65.9	0.0	5.5
TOTALS	$223.0	$0.0	$182.8	$0.0	$40.2

RECOGNITION AND SERVICE

HONORS AND AWARDS

Prizes, Medals, Honors, and High Offices

Richard C. Berg, B. Brandon Curry, Leon R. Follmer, Jonathan H. Goodwin, Ardith K. Hansel, Myrna M. Killey and **James B. Risatti** were elected Fellows of the Geological Society of America.

Keros Cartwright was elected to the Council of the Geological Society of America for the 1994-1996 term. He also serves as Chairman of the Society's Committee on Publications.

Chen-Lin Chou completed a one-year visiting professorship during August of 1994 at the Institute of Applied Geology of the National Central University in Taiwan. During the year, he taught a course in the Geochemistry of Energy Resources and conducted a research project on the Geochemistry of Miocene coals and shales in the Northern Basin of Taiwan with the support of the National Science Council of Taiwan.

Michael J. Chrzastowski was elected 1995 Chairperson for the Society of Sedimentary Geology's Coastal and Shelf Sedimentation Research Group.

Ben Brandon Curry received his Ph.D. in Geology from the University of Illinois-Urbana.

Heinz H. Damberger was appointed an Adjunct Professor of Geology at the University of Illinois-Urbana, effective August 21, 1994. He was also appointed to the Board of Directors of the newly founded National Museum of Coal Mining, which will be located in West Frankfort.

Joseph A. DeBarr received his Master of Science Degree in Environmental Science, May 14, 1995, from the University of Illinois-Urbana.

Joseph A. Devera was awarded volunteer funding by the U.S. Geological Survey to research trace fossils in western Kentucky.

Gary B. Dreher served as Section Leader of the Illinois State Geological Survey for the University of Illinois' 1994 Campus Charitable Fund Drive.

Christine S. Fucciolo received her Master of Science Degree in Biology, May 14, 1995, from the University of Illinois-Urbana.

Debra A. Griest and **Joseph S. Kaczanowski** received Professional Supervisor Certificates by completing the University of Illinois' Professional Supervisor Program.

Beverly L. Herzog will be included in the Who's Who in Science and Engineering, Third Edition (1996-1997).

Dennis R. Kolata was featured, March 12, 1995, in the "Sunday Profile" section of *The Champaign News-Gazette.*

Zakaria Lasemi received the Outstanding New Staff Member Award, November 17, 1994, at the Survey's Annual Review and Poster Fair in Urbana.

E. Donald McKay is an Adjunct Professor in the Department of Geography at Northern Illinois University in DeKalb.

Donald F. Oltz received a National Certificate of Merit in 1995 from the American Association of Petroleum Geologists.

Massoud Rostam-Abadi received the Distinguished Achievement Award, November 17, 1994, at the Survey's Annual Review and Poster Fair in Urbana. He was elected and served as a member of the expert review panel to evaluate and recommend the future research activities of the U.S. Environmental Protection Agency in the area of multi-pollutant emission control, July 18-21, 1994.

William R. Roy was promoted to Associate Professor of Soil Chemistry in the Department of Natural Resources and Environmental Sciences at the University of Illinois-Urbana.

Staff members of the **Maintenance, Operations and Design Unit** and **Gerald E. Glogowski** received A Proclamation of Special Appreciation, November 17, 1994, at the Survey's Annual Review and Poster Fair from members of the staff in appreciation for their special efforts during the remodeling of the Natural Resources Building.

C. Pius Weibel, with co-authors **Curtis C. Abert** and **Matthew H. Riggs,** received the Most Analytical Poster Award for their presentation on the "Geologic/Urban Planning for the Proposed New Site of the Mississippi River Flood-Devastated Town of Valmeyer, Illinois" at the 1994 Midwest/Great Lakes ARC/INFO Users Conference, September 19-21, 1994, in St. Louis, MO.

SCIENTIFIC AND EDUCATIONAL CONTRIBUTIONS

Papers Presented at Scientific Meetings

Curtis C. Abert spoke on "Recent Developments in Digital Data and Methods for the Presentation of Geologic Maps" at the spring meeting of the Illinois Geologic Mapping Advisory Committee, March 30, 1995, in Springfield.

Michael L. Barnhardt presented the paper, "Reclamation Projects on Active Military Training Sites," at the Land Reclamation and Maintenance Conference of the U.S. Army Corps of Engineers, August 8-11, 1994, in Aberdeen, MD. He also attended a reclamation field trip at Aberdeen Proving Ground during that conference. Barnhardt presented another paper, "Monitoring Soil Erosion on Active Military Training Lands," at the national meeting of the American Society of Agronomy and the Soil Science Society of America, November 13-18, 1994, in Seattle, WA. He attended a Department of Defense Legacy reclamation field trip in conjunction with that meeting. At the meeting, February 28-March 3, 1995, in Atlanta, GA., of the International Erosion Control Association, Barnhardt gave a presentation on "Evaluating Reclamation Projects on Active Military Training Sites."

Robert A. Bauer presented a poster on the work in the Midwest of the Central United States Earthquake Consortium's State Geologists at the 5th U.S. National Conference on Earthquake Engineering, July 11-14, 1994, in Chicago. He also orally and by poster presented the results of work, sponsored by the Illinois Clean Coal Institute (ICCI), on a guidelines booklet, summarizing the Illinois Mine Subsidence Research Program (IMSRP) from 1985-1993, at the ICCI's 12th Annual Contractors' Technical Meeting, August 2-3, 1994, in Champaign. At the Indiana Society of Mining and Reclamation, December 6, 1994, in Vincennes, IN, Bauer also presented a talk on the IMSRP's findings over its eight years of research.

Richard C. Berg presented the following papers: "Large and small-scale geologic mapping: the foundation for determining sensitivity of aquifers at various scales" at the 1995 annual meeting of the American Association of Petroleum Geologists, March 5-8, 1995, in Houston, TX; and "Three-dimensional geologic mapping of Quaternary deposits in east-central Illinois" at the 29th annual meeting of the North-Central and South-Central Sections of the Geological Society of America, April 27-28, 1995, in Lincoln, NE.

Subhash B. Bhagwat presented the following papers: "Targeting coal research for success," at the meeting of the Coal Advisory Committee, May 15, 1995, in Champaign; and "Low Oil Prices: Implications for the oil industry and the economy," at the annual meeting of the Illinois Oil and Gas Association, March 2-3, 1995, in Evansville, IN.

Ross D. Brower and **Timothy C. Young** hosted exhibits on the "ISGS' Service and Research Activities in Groundwater" at the trade show of the Illinois Specialty Growers Association, January 10-11, 1995, in Decatur; and the "ISGS' Service and Research Activities in Groundwater for the Water Well Industry," at the Illinois Association of Groundwater Professionals' Annual Exposition, March 20-21, 1995, in Peoria.

Chusak Chaven presented posters on the "Illinois Coal Sample Program" and the "Bibliographical Information System on the Use of the Illinois Basin Coal Sample Program" at the Illinois Clean Coal Institute's 12th annual Contractors' Technical Meeting, August 2-3, 1994, in Champaign.

Cheri A. Chenoweth exhibited a poster on "The Illinois State Geological Survey's Digital Database of Underground Mines" at the Illinois Basin Energy and Mineral Resources Workshop, September 12-13, 1994, in Evansville, IN.

Chen-Lin Chou presented a poster on "Trace elements in Illinois coals and limestones," at the Conference on the Impact of Hazardous Air Pollutants on Mineral Producers and Coal-Burning Plants in the Ohio Valley, March 19-21, 1995, in Lexington, KY.

Mei-In Melissa Chou presented the following papers: "Chlorine in coal and its relationship with boiler corrosion," at the Illinois Clean Coal Institute's 12th annual Contractors' Technical Meeting, August 2-3, 1994, Champaign; "Ash and chlorine composition in coal and coal corrosion potential," at the Electric Power Research Institute's 2nd International Conference on "The Effect of Coal Quality on Coal Power Plants," August 17-19, 1994, in Charleston, SC; and "Chlorine in coal and boiler corrosion," at the 11th Annual International Pittsburgh Coal Conference, September 12-16, 1994, in Pittsburgh, PA.

Michael J. Chrzastowski presented a paper, "Geologic history and human development history of the Illinois coast of Lake Michigan, USA," at the International Geographical Union's Symposium of Coastal Changes, Polish Coast '94, August 27-September 1, 1994, in Gdynia, Poland, and also participated in a field trip examining erosion along the Baltic Sea Coast of Poland. He gave another paper on the "Role of the Illinois State Geological Survey in the 1993 historic flooding in Illinois," at the annual meeting of the Geological Society of America, October 24-27, 1994, in Seattle, WA.

Ben Brandon Curry presented a paper, "Physiochemical variability of small lakes and ponds in south-central Illinois during the last interglacial (Sangamonian)" at the annual meeting of the Geological Society of America, October 24-27, 1994, in Seattle, WA.

Heinz H. Damberger presented a poster, "State coal resources and extraction—Impacts on the economy and environment," at the 10th V. E. McKelvey Forum 1995, Energy and the Environment: Application of Geosciences to Decision-Making, February 13-16, 1995, in Washington, D.C. He also made a presentation on "A mile and more eroded from above the Pennsylvanian System of the Illinois Basin" at a Special Geology Colloquium of the University of Illinois' Department of Geology, in connection with honoring **Jack A. Simon** as first recipient of the department's Alumni Achievement Award, November 8, 1994, in Urbana. **Damberger** and **Colin G. Treworgy** jointly made an oral presentation on "Low and medium sulfur coals in Illinois: Reserves and production," at the meeting of the Coal Advisory Committee, May 15, 1995 in Champaign.

Joseph A. DeBarr presented two papers: "Coal-based Carbon Adsorbents for SO_2 Removal from Flue Gas" at the 2nd Annual Environmental Symposium, April 1995, in Urbana and "Production and Use of Activated Char for Combined SO_2/NO_x Removal" at the 88th annual meeting of the Air and Waste Management Association, June 1995, in San Antonio, TX.

Ilham Demir gave the following three papers: "Washability of trace elements in product coals from Illinois mines," at the Illinois Clean Coal Institute's 12th annual Contractors' Technical Meeting, August 2-3, 1995, in Champaign; "Further reduction of trace elements in product coals from Illinois mines through flotation-based processes" at the Conference on the Impact of Hazardous Air Pollutants on Mineral Producers and Coal-Burning Plants in the Ohio Valley, March 19-21, 1995, in Lexington, KY; and the "Removal of trace elements, including HAP elements of

1990 Clean Air Act amendments, from Illinois coals using conventional and advanced cleaning techniques" at the annual meeting of the Coal Advisory Committee, May 15, 1995, in Champaign.

Joseph A. Devera presented the poster, "Ichnology of Morrowan through Basal Desmoinsian Rocks in Indiana" at the Illinois Basin Energy and Mineral Resources, Workshop, September 12-13, 1994, in Evansville, IN.

Gary B. Dreher presented a poster and a paper on the "Geochemistry of a reclaimed coal slurry impoundment" at the Illinois Clean Coal Institute's 12th annual Contractors' Technical Meeting, August 2-3, 1995, in Champaign. The poster was also presented again at the annual meeting of the Coal Advisory Committee, May 15, 1995, in Champaign.

Paul B. DuMontelle presented the talk, "The continued effort of the Central United States Earthquake Consortium's CUSEC) State Geologists' Hazardous Mapping Program" at the following: the National Earthquake Hazards Reduction Conference, May 31-June 1, 1994, in Louisville, KY; a meeting at the Kentucky Geological Survey, June 16, 1994, in Lexington, KY; a meeting at the Indiana Geological Survey, June 17, 1994, in Bloomington, IN; the International Earthquake Engineering Conference, July 10-14, 1994, in Chicago; a meeting at the Tennessee Geological Survey, August 24, 1994, Nashville, TN; the meeting at Memphis State University and the U.S. Geological Survey's Central Earthquake Resource Information Center, August 26, 1994, in Memphis, TN; the Illinois Basin Consortium's Symposium, September 11-12, 1994, in Evansville, IN; the meeting of CUSEC's Emergency Managers, September 27-28, 1994, in Memphis, TN; a meeting at the Illinois Department of Nuclear Safety, October 18, 1994, in Springfield; the meeting of CUSEC's Board of Directors, November 28-December 1, 1994, in Memphis, TN; and the meeting of CUSEC's State Geologists and Emergency 1994 Organization of State Geologists, February 22, 1995.

Anne L. Erdmann presented the talk, "Geologic evaluation of the proposed new town site, Valmeyer, Illinois" at the 29th annual meeting of the North-Central and South-Central Sections of the Geological Society of America, April 27-28, 1995, in Lincoln, NE.

Leon R. Follmer presented the paper, "Loess studies in central North America," at a symposium on the geology of the lower Mississippi valley: Implications for engineering in the half century since Fisk 1944, given by the U.S. Army Corps of Engineers at the Mississippi River Commission and Waterways Experiment Station, December 4-8, 1994, in Vicksburg, MS.

David A. Grimley presented the paper, "Regional Variation in the Magnetic Susceptibility and Mineralogy of the Peoria Loess and Roxana Silt: Relationships to Wisconsinan Glaciations," at the 29th annual meeting of the North-Central and South-Central Sections of the Geological Society of America, April 27-28, 1995, in Lincoln, NE.

Keith C. Hackley presented the paper, "Environmental isotope characteristics of ground water from the Mahomet Valley Aquifer in East-Central Illinois," at the annual meeting of the Geological Society of America, October 24-27, 1994, in Seattle, WA.

Ardith K. Hansel presented the paper, "Till deposition from a deforming bed near Wedron in north-central Illinois, USA," at the meeting and excursion of the International Quaternary Association Commission on the Formation and Properties of Glacial Deposits, August 16-21, 1994, in Reykjavik, Iceland.

Manoutchehr Heidari presented the following papers: "Geochemistry of a Reclaimed Coal Slurry Impoundment," at the Illinois Clean Coal Institute's 12th annual Contractors' Technical Meeting, August 2-3, 1994, in Champaign; and "Aquifer Calibration Models and Their Role in the Management of Groundwater Resources" and the "Role of Research in the Management and Planning of Water Resources," at the Regional Conference on Water Resources Management, Isfahan University of Technology, August 28-September 1, 1994, in Isfahan, Iran.

Kathleen M. Henry presented the poster, "The Bibliographical Information System on the Use of the Illinois Basin Coal Sample Program" at the Illinois Clean Coal Institute's 12th annual

Contractors' Technical Meeting, August 2-3, 1994, and at the annual meeting of the Coal Advisory Committee, May 15, 1995, both in Champaign.

Beverly L. Herzog presented the summary for the closing session on "Research on Agricultural Chemicals in Illinois Groundwater: Status and Future Directions V" at the 5th Annual Conference of the Illinois Groundwater Consortium, March 29-30, 1995, in Makanda.

Randall E. Hughes presented the following papers: "Quantitative XRD: The minerals make the difference," at the 31st annual meeting of the Clay Mineral Society, August 13-18, 1994, in Saskatoon, Saskatchewan, Canada, and repeated the presentation and took a field trip at the 31st Forum on the Geology of Industrial Minerals, April 23-27, 1995, in El Paso, TX; "Improved mineralogical analysis of IBCSP coals," at the Illinois Clean Coal Institute's 12th annual Contractors' Technical Meeting, August 2-3, 1994, in Champaign; "Brick manufacture with fly ash from Illinois coals," at the annual meeting of the Coal Advisory Committee (CAC), May 15, 1995, in Champaign; and "The occurrence of berthierine in flint clays," at the 32nd annual meeting of the Clay Mineral Society, June 3-8, 1995, in Baltimore, MD. He also presented the poster, "Illinois Basin Coal Sample Program: Improved mineralogical analyses," at the annual meeting of the CAC.

Bryan G. Huff presented the paper, "Geological Characterizations and Visualization of the Gas Storage Reservoir at the Hillsboro Field, Montgomery County, Illinois," at the annual meeting of the Eastern Section of the Society of Petroleum Engineers, November 8-10, Charleston, WV.

Paul C. Jahn presented the poster, "A Predictive Model for Shallow Groundwater Levels in Glacial Till in Central Illinois," at the annual meeting of the Geological Society of America, October 24-27, 1994, in Seattle, WA.

Donald A. Keefer presented the paper, "Township Ratings of Susceptibility: What Do These Ratings Mean?" at the Illinois Agricultural Pesticides Conference, January 4-5, 1995, at the University of Illinois-Urbana.

Latif A. Khan presented the paper, "Acquisition and Characterization of Coal-Fired Scrubber By-Products," at the Technical Advisory Committee's meeting on Coal Combustion Residues Management, October 26, 1994, in Carbondale.

Dennis R. Kolata presented the following papers, "History of the Illinois Basin: An overview," at the Illinois Basin Energy and Mineral Resources Workshop, September 12-13, 1994, in Evansville, IN; and "Ordovician K-bentonite beds discovered in the Precordillera of Argentina," at the annual meeting of the Geological Society of America, October 24-27, 1994, in Seattle, WA.

Robert J. Krumm presented the following papers: "Documentation and Procedural Issues for GIS Project Implementation," at the Midwest/Great Lakes Arc/Info User Conference, September 21, 1994, in St. Louis, MO; "GIS Screening Activities for a Low-Level Radioactive Waste Facility in Illinois," at the regional GIS meeting of the Midwest Soil Conservation Service, October 5, 1994, in Champaign; "Geologic Mapping to Identify Potential Locations for a Low-Level Radioactive Waste Disposal Facility in Illinois," at the meeting of the Illinois Geological Mapping Advisory Committee, March 30, 1995, in Springfield; "Geologic Mapping for County Landfill Screening in Illinois," at the meeting of the Greater Illinois Section of the American Planning Association, June 2, 1995, in Bloomington; "Documentation Procedures for GIS Database Development," at a GIS Technology Conference, sponsored by GIS Solutions, Inc., June 29, 1995, in Springfield.

David R. Larson presented the poster, "Competition for Groundwater; An Example from Danville, Illinois," at the 39th Annual Midwest Groundwater Conference, October 16-18, 1994, in Bismarck, ND.

Timothy H. Larson presented the poster, "Revisiting a 1955 resistivity survey over a buried bedrock valley aquifer," at the Symposium on the Application of Geophysics to Engineering and Environmental Problems, April 23-26, 1995, in Orlando, FL.

Zakaria Lasemi presented the poster, "Waulsortian mounds and hydrocarbon-bearing facies in the Ullin ('Warsaw') Limestone of the Illinois Basin," at the Illinois Basin Energy and Mineral Resources Workshop, September 12-13, 1994, in Evansville, IN. **Lasemi** and **John P. Grube** presented the poster, "Reservoir Development in Bryozoan Bafflestone Facies of the Ullin 'Warsaw' Limestone (Middle Mississippian) in the Illinois Basin," at the Eastern Section meeting of the American Association of Petroleum Geologists, September 18-20, 1994, in East Lansing, MI, and at the annual meeting of the Illinois Oil and Gas Association, March 2-3, 1995, in Evansville, IN, at which Lasemi also gave an oral presentation on "Carbonate mud mound and bryozoan bioherm development in the Warsaw: an exploration model in the Illinois Basin."

Hannes E. Leetaru made the following presentations: "Improved oil recovery in mature fields through reservoir characterization and management," at the Illinois Geological Society, November 11, 1994, in Fairfield; and "Seismic character analysis of a mixed-siliciclastic-carbonate reservoir," at the Illinois Basin Consortium's Workshop on Energy and Mineral Resources, September 12-13, 1994, in Evansville, IN, and again at the annual meeting of the American Association of Petroleum Geologists, March 3-9, 1995, in Houston, TX.

Anthony A. Lizzio gave the following papers: "Synthesis of Carbon Molecular Sieves from Illinois Coal: Carbon Versus Oxygen Deposition" and "Production of Activated Char from Illinois Coal for Combined SO_2/NO_x Removal," at the International Conference on Carbon, August 1994, in Granada, Spain; "Production of Carbon Molecular Sieves from Illinois Coal," and a poster on the topic at the Illinois Clean Coal Institute's (ICCI) 12th annual Contractors' Meeting, August 1-3, 1994, in Champaign, and repeated the poster at the International Activated Carbon Conference, September 18-21, 1994, in Pittsburgh, PA. Other presentations of papers included: "Production and Use of Activated Char for Combined SO_2/NO_x Removal," and a poster on the topic at the ICCI's 12th annual Contractors' Meeting, both at the International Activated Carbon Conference, and the oral presentation at the American Institute of Chemical Engineers (AIChE) Spring National Meeting, March 21-26, 1995, in Houston, TX, at which he also made an oral presentation on the "Synthesis of Carbon Molecular Sieves from Illinois Coal." Lizzio made an oral presentation on "High Activity Char from Illinois Coal for the Combined Removal of SO_2/NO_x from Flue Gases" at the meeting of the Coal Advisory Committee, May 15, 1995 in Champaign. He also presented papers on "Oxidation/Desorption Treatment of Carbon to Enhance Its Adsorptive/Catalytic Properties" and "Production of Low Activity Char for Cleanup of Incinerator Flue Gas," at the 22nd Biennial Conference on Carbon in San Diego, CA.

John M. Lytle presented the following papers: "Use of Illinois Coal Preparation Plant Fines in Slurry-Fed Gasifiers" at an International Conference on High Efficiency Coal Preparation, March 6-9, 1995, in Denver, CO; and "Marketable Products from FGD-Gypsum," at the meeting of the Coal Advisory Committee, May 15, 1995, in Champaign.

Melisa M. McLean presented the following papers: "Application of GIS and Modeling Software for County Landfill Siting in Illinois," at the 29th annual meeting of the North-Central and South-Central Sections of the Geological Society of America, April 27-28, 1995, in Lincoln, NE; and "Using GIS to Construct Geologic Maps for Landfill Screening in McLean County, Illinois," at the 1995 International ESRI Users Conference, May 22-26, 1995, in Palm Springs, CA.

Edward Mehnert presented the paper, "The Characterization of the Field-Scale Preferential Transport of Agricultural Chemicals—Status Report," at the 5th Annual Conference of the Illinois Groundwater Consortium on "Research on Agricultural Chemicals in Illinois Groundwater: Status and Future Directions V," March 29-30, 1995, in Makanda.

Donald G. Mikulic presented the poster, "Early Silurian reefs in Wisconsin and Illinois," at the 29th annual meeting of the North-Central and South-Central Sections of the Geological Society of America, April 27-28, 1995, in Lincoln, NE, during which he participated in the field trip to the Ashfall Fossil Beds.

Michael V. Miller presented the paper, "Hydrogeological Information, Wetland Site Selection, and Wetland Design" and participated in a field trip to Jean Lafitte National Park Wetlands at the National Interagency Workshop on Wetlands entitled "Technology Advances for Wetlands

Science," sponsored by The Waterways Experiment Station of the U.S. Army Corps of Engineers, April 3-7, 1995, in New Orleans, LA.

James J. Miner presented the paper,"Hydrogeology and restoration potential of a partially drained fen, northeastern Illinois," and attended a field trip to the bogs in Saco Heath, ME, during the 16th annual meeting of the Society of Wetland Scientists, May 28-June 2, 1995, in Cambridge, MA.

Duane M. Moore presented the following papers: "Systematic Analysis of Chlorites and Illites," at the 31st annual meeting of the Clay Minerals Society, August 15-18, 1994, in Saskatoon, Saskatchewan, Canada; and "Windows of insight: Röntgen, the Braggs, and others," at the 32nd annual meeting of the Clay Minerals Society, June 3-8, 1995, in Baltimore, MD, during which he attended a field trip on Clays and Clay Minerals in Soil-Geologic Columns of the Piedmont and Inner Coastal Plain and organized and chaired a symposium on "100 Years of X-rays" in commemoration of the 100th anniversary of the discovery of X-rays.

David G. Morse presented a paper, "Distribution and lithologic (organic) facies of the New Albany Shale in the Illinois Basin," at the Gas Research Institute and the Illinois Basin Consortium's workshop, March 1, 1995, in Evansville, IN, and presented a poster, "Characterization of the Chesterian Tar Springs Sandstone, Inman Consolidated Field, Gallatin County, Illinois," at the annual meeting of the Illinois Oil and Gas Association, March 1-2, 1995, in Evansville, IN.

W. John Nelson presented the poster, "Caseyville and Tradewater Formations (Pennsylvanian), southern Illinois Basin: sequence stratigraphy and concurrent tectonism," at the 29th annual meeting of the North-Central and South-Central Sections of the Geological Society of America, April 27-28, 1995, in Lincoln, NE.

Rodney D. Norby presented a paper, "Revised Age of the Thornton Reef (Silurian, Illinois)," at the 29th annual meeting of the North-Central and South-Central Sections of the Geological Society of America, April 27-28, 1995, in Lincoln, NE. In conjunction with this meeting, he attended the Pander Society Symposium.

Donald F. Oltz presented the following papers, "The Petroleum Technology Transfer Council—the Midwest Region," September 11-13, 1994, at the Illinois Basin Consortium's Energy and Mineral Resources Workshop in Evansville, IN; "An Industry View of the New Technology and Inventions Needed by the Independent Petroleum Industry by 2025," December 4-6, 1994, at the Interstate Oil and Gas Compact Commission's (IOGCC) annual meeting in Long Beach, CA; and "The national program of the Petroleum Technology Transfer Council," June 10-13, 1995, at the IOGCC's 1995 midyear meeting in Charleston, WV, during which he also chaired a committee.

Samuel V. Panno presented the following papers: "Chemistry of ground water within the Mahomet Bedrock Valley Aquifer, east-central Illinois: Implications for recharge and groundwater movement," at the meeting of the Illinois Groundwater Association, October 6, 1994, in Springfield; "A device for the collection of time-integrated, discharge-weighted water samples from springs and streams," at the annual meeting of the Geological Society of America, October 24-27, 1994, in Seattle, WA; and "Effects of karst terrain on the occurrence of agrichemicals in ground water in the southwestern Illinois sinkhole plain," at the 5th Annual Conference of the Illinois Groundwater Consortium on "Agricultural Chemicals in Illinois Groundwater: Status and Future Directions V," March 29-30, 1995, in Makanda.

James B. Risatti presented the following papers: "Transport and fate of agrichemicals in an alluvial aquifer: A status report," at the 5th Annual Conference of the Illinois Groundwater Consortium on "Research on Agricultural Chemicals in Illinois Groundwater: Status and Future Directions V," March 28-29, 1995, in Makanda; and "Stratification of sulfate reducing bacteria in a saline microbial mat," at the annual meeting of the Geological Society of America, October 24-27, 1994, in Seattle, WA.

Nancy L. Rorick presented a paper, "An Overview of Selecting and Evaluating Wetland Mitigation Sites from a Hydrogeological Perspective," at the meeting of the Illinois Groundwater Association, March 22, 1995, in Batavia.

Massoud Rostam-Abadi presented the following papers: "Production and Evaluation of High-Surface-Area Hydrated Lime," at the Illinois Clean Coal Institute's 12th annual Contractors' Technical Meeting, August 2-3, 1995, in Champaign; "Sulfur Dioxide Reactivity of Limestone and Dolomite under Pressurized Fluidized-Bed Combustion," at the annual meeting of the American Institute of Chemical Engineers, November 13-18, 1994, in San Francisco, CA; and "Preparation of Adsorbent Carbons from Scrap Tire and Illinois Coal for Natural Gas Storage," at the spring national meeting of the American Institute of Chemical Engineers, March 19-23, 1995, in Houston, TX, during which he organized and chaired international symposiums on "Carbon-Based Materials for Gas Separations."

William R. Roy presented the following papers: "Atrazine Leaching from Fill Materials at Retail Agrichemical Facilities," at the annual meeting of the American Society of Agronomy, November 13-18, 1994, in Seattle, WA; and "Fate and transport of atrazine in fill materials at agrichemical facilities: A status report," at the 5th Annual Conference of the Illinois Groundwater Consortium on "Research on Agricultural Chemicals in Illinois Groundwater: Status and Future Directions V," March 29-30, 1995, in Makanda, during which he also presented a talk on the "Evaluation of pesticide releases from retail agrichemical facilities during the 1993 flooding in Illinois."

Edward C. Smith presented a paper, "Geology and groundwater resources of Will and southern Cook Counties, Illinois," at the U.S. Environmental Protection Agency's Conference on Environmental Problem Solving Using GIS, September 20-23, 1994, in Cincinnati, OH.

Lisa R. Smith presented a paper, "Computer-Assisted Techniques to Map Subsurface Lithologic Variations in Glacigenic Deposits for Landfill Site Selection," at the Conference on Solid Waste Research and Technology, sponsored by the Institute for Environmental Studies at the University of Illinois and the Office of Solid Waste and Recycling of the Department of Energy and Natural Resources, March 28-29, 1995, in Rosemont.

Beverly Seyler presented the following papers: "Diagenetic Alteration and Porosity Enhancement of Two Middle Mississippian Sandstone Reservoirs in the Illinois Basin," at the Illinois Basin Energy and Mineral Resources Workshop, September 12-13, 1994, in Evansville, IN; and "Improved Oil Recovery through Integration of Geologic and Engineering Data in Comprehensive Programs of Reservoir Management," at the annual meeting of the American Association of Petroleum Geologists, March 3-9, 1995, in Houston, TX.

Christopher J. Stohr presented the following posters: "Preserving Illinois' Past," an exhibit on efforts to preserve irreplaceable, historical, aerial photography owned by the University of Illinois-Urbana's Map and Geography Library during March 1995 in the Main Library, Urbana; and "The Preservation of Historical Aerial Photography Utilizing High Resolution Digital Scanning Technology," November 7, 1994, at the annual GIS in Illinois Conference in Arlington Heights.

C. Brian Trask presented the paper, "Adjustments of nearshore sediment-transport processes to an engineered shore facility at Lake Forest, Illinois," April 27-28, 1995, at the 29th annual meeting of the North-Central and South-Central Sections of the Geological Society of America in Lincoln, NE.

Colin G. Treworgy presented the following papers: "Constraints on the Availability of Coal for Mining in Illinois," at the annual meeting of the Society for Mining Metallurgy and Exploration, March 8, 1995, in Denver, CO; and "Geological Constraints on the Mining of Coal in Illinois," at the Illinois Basin Energy and Mineral Resources Workshop, September 12-13, 1994, in Evansville, IN.

Janis D. Treworgy presented papers on "Waulsortian mounds and hydrocarbon-bearing facies in the Ullin ('Warsaw') Limestone of the Illinois Basin," and "Preliminary Identification of transgressive-regressive depositional cycles in the Chesterian Series in southern Illinois," at the Illinois Basin Energy and Mineral Resources Workshop, September 12-13, 1994, in Evansville, IN.

C. Pius Weibel made the following presentations: "Karst Areas of Carbonate Bedrock of Illinois," at the 1994 Midwest/Great Lakes ARC/INFO Users Conference, September 19-21, 1994, in St. Louis, MO; "Transgressive-Regressive Unit Recognition Is the Key to Determination of Sequence

Boundaries in Middle and Upper Pennsylvanian Strata in the Illinois Basin," "Effects of Karst Terrain on the Occurrence of Agrichemicals in Ground Water in the Illinois Sinkhole Plain," and "Geologic Factors for Statewide Screening for a Low-Level Radioactive Waste Disposal Facility in Illinois," at the 29th annual meeting of the North-Central and South-Central Sections of the Geological Society of America, April 27-28, 1995, in Lincoln, NE.

Emmanuel O. Udegbunam presented the following papers: "Geological Characterization and 3-D Visualizations of the Gas Storage Reservoir at Hillsboro Field, Montgomery County, Ill." and "Model for Locating Fluids' Contacts in Petroleum Reservoirs," at the Eastern Regional Meeting of the Society of Petroleum Engineers, November 8-10, 1994, in Charleston, WV; and "Reservoir Simulation Studies of Aux Vases and Cypress Reservoirs in Illinois," at the Illinois Basin Energy and Mineral Resources Workshop, September 12-13, 1995, in Evansville, IN.

Scientific Workshops/Training Courses Taught or Attended

Curtis C. Abert, Michael L. Barnhardt and **Daniel O. Nelson** participated in the meeting of the Illinois Geologic Mapping Advisory Committee, September 8, 1994, in Champaign. Abert also attended the Dynamic Graphics Eastern Regional User Meeting, October 21, 1994, in Aberdeen, MD. **Abert, Daniel O. Nelson, Matthew H. Riggs** and **C. Brian Trask** attended the GIS in Illinois Conference, November 7-8, 1994, in Arlington Heights.

Daniel J. Adomaitis attended an X-MET 920 training course on the use of the X-ray fluorescence (XRF) instrument, October 11-13, 1994, in Langhorne, PA. **Adomaitis** and **Mark A. Hart** attended the Superfund XV Conference, November 29-December 1, 1994, in Washington, D.C. **Adomaitis, Phyllis L. Bannon, James W. Geiger, Hart, Alison M. Meanor** and **C. Brian Trask** attended an 8-hour refresher course for hazardous waste workers, December 20, 1994, in Savoy.

Galen W. Arnold participated in the short course on Advanced Programming in C++, June 20-30, 1995, at the University of Illinois-Urbana.

Phyllis L. Bannon and **Anne L. Erdmann** attended a workshop on the "Fundamentals of Project Management for Environmental Professionals," November 15-18, 1994, in Atlanta, GA. **Bannon** and **Nancy L. Rorick** attended the "National Wetlands Inventory Workshop," May 18, 1995, at the Illinois State Water Survey, Champaign. Bannon also attended a course, "Introduction to Physical Processes in Contaminant Hydrogeology," June 28-30, 1995, in Chicago.

Robert A. Bauer attended the symposium and workshop on Time Domain Reflectometry in Environmental, Infrastructure, and Mining Applications, September 9, 1994, in Evanston and the Federal Emergency Management Agency's Mitigation Forum, October 13, 1994, in Chicago. **Bauer, Nelson Kawamura, Dennis R. Kolata, E. Donald McKay, David G. Morse, Christopher J. Stohr** and **C. Pius Weibel** took a short course on Geological Aspects of Fracture Mechanics, November 11, 1994, in Champaign. Bauer made a presentation on seismic expectations and the history of earthquakes in the Midwest at a course for instructors to learn how to teach post-earthquake assessments of damage to buildings, February 14, 1995, in Springfield. He attended the Central United States Earthquake Consortium's (CUSEC) meeting of State Geologists, April 2, 1995, in New Harmony, IN, at which he presented the subcommittee's methodologies to classify soils in the Paducah $1^{\circ} \times 2^{\circ}$ Quadrangle for site amplification attributable to the seismic activity of earthquakes. He also attended a meeting of midwestern geophysicists, January 26-29, 1995, in Memphis, TN, which was held to form a compact to secure monitoring equipment for earthquakes and to discuss the collection of aftershock information. Bauer presented CUSEC's State Geologists' mapping projects and how their response to an earthquake needs to be integrated with the individual state's responses to such an event. He participated in a workshop on seismic-hazard mapping for the central and southeastern United States, April 18-19, 1995, in Memphis, TN. At CUSEC's Program Managers' meeting, April 25, 1995, in Springfield, Bauer made presentations covering the work of CUSEC's State Geologists in seismic-hazard mapping and earthquake scenarios produced for exercises. In addition, he was an instructor for the Illinois Emergency Management Agency's course on Earthquake Exercise Design, May 10, 1995, in

Fairview Heights. The ISGS produced an earthquake scenario for an exercise in southwestern Illinois to be held on October 17, 1995.

Richard C. Berg attended the American Society for Testing and Materials' work group to develop a guide for determining the sensitivity and vulnerability of aquifers, April 3-5 and July 10-11, 1995, in Denver, CO.

Richard A. Cahill attended the National Interagency Workshop on Wetlands: Technology Advances for Wetland Science, sponsored by the U.S. Army Corps of Engineers, April 3-7, 1995, in New Orleans, LA, and the Water Quality Standards Academy - Basic Course, presented by the U.S. Environmental Protection Agency's Office of Water and Office of Science and Technology, May 15-19, 1995, in Minneapolis, MN.

Keith W. Carr attended a short course on Performing Phase I Environmental Assessments, December 12, 1994, in St. Louis, MO. **Carr** and **Somendra Chakravorty** attended a field workshop on Accelerated Site Characterization Methods, given by the U.S. Environmental Protection Agency, April 6, 1995, in Hammond, IN.

Somendra Chakravorty attended a conference on Environmental Remediation in Illinois, organized by the Institute of Business Law of California State University, March 15, 1995, in Chicago.

Cheri A. Chenoweth attended a course on Interactive Surface Modeling with Earthvision, April 17-22, 1995, in Alameda, CA.

Michael J. Chrzastowski made a presentation, "Lessons learned from the southern Lake Michigan Coastal Erosion Study," at the Workshop on Lake Erie's Coastal Erosion Study, January 30-February 4, 1995, in St. Petersburg, FL. He also attended a one-day seminar on "What's New in ARC/INFO 7.0?" at the GIS in Illinois Conference, November 7-8, 1994, in Arlington Heights.

Ben Brandon Curry presented a workshop on the Quaternary Geology of McHenry County for the McHenry County Board of Health, May 13, 1995, in Woodstock. He and **Richard C. Berg** led a field trip as part of the event. Curry's dissertation colloquium, entitled "Late Quaternary paleolimnology of south-central Illinois," was given in the Department of Geology at the University of Illinois, November 24, 1994, in Urbana.

Heinz H. Damberger was the co-leader of a group discussion on Illinois Basin Coal Resource Issues at the workshop on Illinois Basin Energy and Mineral Resources, September 12-13, 1994, in Evansville, IN.

Sally L. Denhart taught a class for staff members on "Networking at ISGS 1995," providing information on how to use Electronic Mail, FTP, Gopher and Netscape, on April 27, May 2 and May 12, 1995, in Champaign.

F. Brett Denny completed an eight-hour training program on conducting Environmental Site Assessments, given by the Environmental Assessment Association of America, December 16, 1994, in St. Louis, MO. He made a presentation on "The Status of the State Geologic Mapping Program of the Illinois State Geological Survey" to the Illinois Geologic Mapping Advisory Committee, March 30, 1995, in Springfield.

William S. Dey completed two courses at the University of Illinois-Urbana: Surface Hydrology, Civil Engineering 350, in the fall 1994 and Hydraulics of Surface Drainage, Civil Engineering 356, in the spring 1995. He took a short course in the Evaluation of Uncertainty in Hydrologic and Water Quality Models, June 22, 1995, in Chicago.

Sandrine A. Schultz Elinski completed the following courses during the 1994-1995 academic year at the University of Illinois-Urbana: Geology of North America and Seismology, both in the Department of Geology; and Computer Programming for Engineering, in the Computer Science

Department. She helped present an ArcView Demonstration at the 32nd Annual Clinic on Library Applications of Data Processing, April 1-2, 1995, in Urbana.

Anne L. Erdmann, Gregory A. Kientop and **Dale R. Schmidt** attended an eight-hour Refresher Course for Hazardous Waste Site Personnel, January 26, 1995, in Countryside.

Christine S. Fucciolo, James J. Miner and **Nancy L. Rorick** completed a short course in Creating Wetlands for Habitat Enhancement and Mitigation, April 27-28, 1995, at the University of Wisconsin-Madison.

Jeffrey W. Gadt and **C. Brian Trask** attended a conference of the U.S. Environmental Protection Agency on Accelerated Leaking UST Site Characterization Methods, April 4-5, 1995, in Chicago. **Gadt, Damon A. Garner, Dale R. Schmidt** and **Trask** attended a field demonstration of site-characterization equipment, April 6, in Hammond, IN.

John P. Grube and **Donald F. Oltz** attended the U.S. Geological Survey's Workshop on Assessment of Oil and Gas Reserves of the Illinois Basin, October 11-12, 1994, in New Harmony, IN. Grube attended combined meetings of the Illinois, Indiana and Kentucky Geological Societies, October 13, 1994, February 16, 1995, and April 20, 1995, in Grayville. He also attended the New Albany Shale Workshop, March 1, in Evansville, IN.

Dennis J. Haggerty attended the Well Analysis and Echometer School, April 25-26, 1995, in Gaylord, MI.

Manoutchehr Heidari audited the course, "Automatic Derivative Techniques," Computer Science CS 491, spring 1995, at the University of Illinois-Urbana. He lectured on "Anisotropic Analysis of Local Aquifer Using Pumping-Test Data" and presented a one-day short course on "Water Resources Planning" to staff members of the Shiraz Regional Water Resources Authority, September 1994, in Shiraz, Iran; gave a five-day course on "Water Resources Planning and Management" to the staff members and researchers of the Iran Ministry of Power and Water, September 1994; and presented a lecture, "Geologic Data and Their Use in the Management of Groundwater Resources," at the Groundwater Quality Forum, April 20, 1995, at Southern Illinois University-Carbondale.

Beverly L. Herzog taught the following: the groundwater portion of a short course "Fundamentals of Environmental Sampling" with a co-instructor, through E^3, August 17-18, 1994, at El Paso Natural Gas in Farmington, NM; repeated the session with co-instructor, October 19-21, 1994, in Columbus, OH; and presented a one-day short course on the same topic, May 1, 1995, in Tuscaloosa, AL, repeating it March 22-24, 1995, in Atlanta, GA.

Nelson Kawamura presented the paper, "TDR Cables, Inclinometers and Extensometers to Monitor Coal Mine Subsidence in Illinois," at a symposium and workshop on Time Domain Reflectometry in Environmental, Infrastructure, and Mining Applications, September 9, 1994, at Northwestern University, Evanston.

Myrna M. Killey hosted the poster, "Every Day Is Earth Day," at the Expanding Your Horizons in Math and Science Workshop, March 25, 1995, at Sangamon State University, Springfield.

Ivan G. Krapac attended a short course, "Practical karst hydrogeology with emphasis on ground-water monitoring," August 2-5, 1994.

Robert J. Krumm attended a training class and workshop on the U.S. Geological Survey's Geographic Information Visualization Software, September 25, 1994, in Denver, CO.

Timothy H. Larson attended the following workshops in Memphis, TN: "Seismic Response Planning for the Central United States," January 25-26, 1995; and "Seismic Hazards Mapping for the Central and Eastern United States," April 17-19, 1995.

Alison B. Lecouris attended the International Oracle User's meeting, September 26-30, 1994, in San Francisco, CA.

John M. Masters presented a progress report and highlights of STATEMAP 7.5-minute quadrangle mapping in southernmost Illinois, describing the discovery of features that may represent movement on bedrock faults as recent as the mid-Pleistocene, at a meeting of the Illinois Geologic Mapping Advisory Committee, September 7, 1994, in Urbana.

Jennifer K. Mattes attended a Hazardous Materials Management Seminar, May 11-12, 1995, in Westchester.

E. Donald McKay coordinated the program and presented a talk on the Prospects and Priorities for Geologic Mapping Programs in Illinois for the meeting of the Illinois Geologic Mapping Advisory Committee (IGMAC), September 8, 1994, in Urbana. For the meeting of IGMAC on March 30, 1995, he coordinated the program and presented a talk on the National Cooperative Geologic Mapping Program and the Status of Geologic Mapping Programs in Illinois. He attended the Champaign County Network Workshop, September 29, 1994, in Urbana. **McKay** also attended the 4th annual GIS in Illinois Conference, November 7-8, 1994, in Arlington Heights, during which he and **Barbara J. Stiff** presented a workshop on "The Experience of the Illinois State Geological Survey in Using GIS for Cartographic Production." He was an invited presenter on "Paleoenvironmental records in loess of the Midwest" and the "GIS and Internet as tools for climate model data archive and data sharing" at the Multiproxy Paleoenvironmental Mapping Workshop, December 3-4, 1994, in San Francisco, CA. He was co-organizer, through the Board of Directors of the Illinois GIS Association, of the GIS in Illinois Conference, June 7, 1995, in Champaign.

Melisa M. McLean presented an overview of the ISGS' County Assistance Program and a sampling of geologic maps produced under the program as well as discussed how the program has assisted counties in landfill screening at the March 30, 1995, meeting of the Illinois Geological Mapping Advisory Committee in Springfield.

Edward Mehnert attended a training seminar on the "Use of groundwater transport models available from the Electric Power Research Institute," hosted by Illinois Power Company, July 18-19, 1994, in Decatur and the Hydraulic Engineers Luncheon, November 17, 1994, in Champaign.

Michael V. Miller participated in the short course on "Watershed Hydrology and Water Quality" and a field trip on "Wetlands Mitigation/Morten Arboretum," at the American Water Resources 30th Annual National Conference and Symposia, November 5-10, 1994, in Chicago. He participated in a training course, "HEC-1: The Flood Hydrograph Package," March 13-17, 1995, at Rutgers University, New Brunswick, NJ. Miller attended and was a field instructor for the U.S. Army Corps of Engineers' regulatory course on "Wetland Ecology and the Assessment of Wetland Functions," April 22-28, 1995, in Charleston, SC. He attended the annual meeting of the Society of Wetland Scientists on "Wetland Understanding and Wetland Education," May 28-June 2, 1995, in Cambridge, MA, during which he took a short course on "Freshwater Mitigation: Planning Hydrology and Establishing Vegetation" and attended a field trip, "Created and Restored Wetlands of Maine, New Hampshire, and Massachusetts."

David G. Morse attended the Power Point Presentations Workshop, April 28, 1995, in Urbana; the section meeting of the Society of Petroleum Engineers on "3-D Seismic Applications," May 10, 1995 in Pontiac; and an eight-hour annual HAZWOPPER Refresher Course, June 22, 1995, in Peoria.

Daniel O. Nelson attended the meeting of the Illinois Geologic Mapping Advisory Committee, March 30 1995, in Springfield; and presented the software demonstration "Using ArcView" at the GIS and Libraries 32nd Annual Clinic on Library Applications of Data Processing, April 1-2, 1995, in Champaign. Nelson attended a meeting on the GIS for River Basin Management: The SAST as a Prototype for Federal/State/Tribal Cooperation, May 4-5, 1995, in Chicago and the 1995 National GeoData Forum, May 7-10, 1995, in Washington, D.C.

Donald F. Oltz attended the Petroleum Technology Transfer Council's Problem Identification Workshop, October 14, 1994, in Mt. Vernon, for which **John P. Grube, David G. Morse** and **Beverly Seyler** were facilitators.

Michael A. Phillips and **Nancy L. Rorick** attended Southern Illinois University's Groundwater Forum in Carbondale on August 22 and November 21, 1994; January 19, February 16, and April 20, 1995. He also completed three courses: Astronomy 111, fall 1994, and Geology 213, spring 1995, at Shawnee Community College in Ullin; and Physical Science 111, summer 1995, at John A. Logan Community College, Carterville.

Richard J. Rice attended the meeting of the Illinois Association of Groundwater Professionals, March 20-21, 1995, in Peoria.

Nancy L. Rorick attended a workshop, "Management of Forest Wetland Ecosystems in the Central Hardwood Region," sponsored by Purdue University's Department of Forestry, October 11-12, 1994, in Evansville, IN. Rorick made a presentation on "Research Needs in Wetland Mitigation" to the Southern Illinois University's Groundwater Forum, December 19, 1994, in Carbondale.

Massoud Rostam-Abadi attended the U.S. Environmental Protection Agency's Multi-Pollutant Control Workshop, July 19-20, 1994, in Research Triangle Park, NC.

Edward C. Smith and **C. Pius Weibel** attended an Environmental Educational Enterprises short course on "Practical Karst Hydrology," August 2-5, 1994, in Cave City, KY. Smith spoke on the "Geology and Groundwater Resources of Will and Southern Cook Counties, Illinois," at the Illinois Geologic Mapping Advisory Committee's meeting, September 8, 1994.

Christopher J. Stohr attended factory training in the use of the Trimble Pathfinder Professional GPS during August 1994 at Trimble Navigation Inc., Sunnyvale, CA, and then trained four staff members in the use of the equipment. He spoke on "GPS Experiences at the Illinois State Geological Survey" at the U.S. Department of Agriculture's 1994 Midwest Soil Conservation Service's GIS Meeting, October 3, 1994, in Champaign. Stohr attended a workshop on the HELP Model, sponsored by the Department of Civil Engineering at the University of Illinois-Urbana on March 20, 1995. He also attended the 1995 Conference on Solid Waste Research and Technology, March 28, 1995, in Rosemont. In addition, Stohr made a presentation on "Global Positioning Systems (GPS): Their Capabilities and Applications to Mapping," at the meeting, March 30, 1995, of the Illinois Geological Mapping Advisory Committee in Springfield.

Colin G. Treworgy presented "Coal availability mapping in Illinois," September 8, 1994, to the Illinois Geological Mapping Advisory Committee in Champaign.

Janis D. Treworgy made a presentation on "The Illinois Basin Geological Cross Section Program" at the meeting of the Illinois Geological Mapping Advisory Committee, March 30, 1995, in Springfield.

Emmanuel O. Udegbunam organized a workshop on "Microbially Enhanced Oil Recovery," which was sponsored jointly by the ISGS and the U.S. Department of Energy, February 17, 1995, in Grayville. **John P. Grube** served as a moderator for that workshop. Udegbunam attended a workshop on "Economics and Reservoir Simulation" at the meeting of the Illinois Basin Section of the Society of Petroleum Engineers (SPE), January 19, 1995, in Grayville and a workshop on "Applications of 3-D Seismic in Illinois" at the meeting of the Midwest Gas Storage Section of SPE, May 10, 1995, in Pontiac.

Timothy C. Young attended a Radiation Safety Short Course, sponsored by the Illinois Department of Transportation, February 8-9, 1995, in Springfield.

Participation in Scientific Conferences and Field Trips

Phyllis L. Bannon, Somendra Chakravorty, Anne L. Erdmann, Alison M. Meanor and **C. Brian Trask** attended a field trip on the Geomorphology and Engineering Geology of the Chicago Shoreline of Lake Michigan, hosted by the Illinois Association of Environmental Professionals, July 27, 1994, in Chicago. **Michael J. Chrzastowski** was a leader for this expedition.

Michael L. Barnhardt and **Edward Mehnert** participated in the Illinois Agricultural Pesticides Conference, January 4-5, 1995, at the University of Illinois-Urbana. **Barnhardt, Steven E. Benton, F. Brett Denny, Leon R. Follmer, David A. Grimley, Ardith K. Hansel, John M. Masters, E. Donald McKay, Michael V. Miller, Nancy L. Rorick, Barbara J. Stiff, Christopher J. Stohr** and **Wen-June Su** participated in the 42nd Annual Field Conference, sponsored by the Midwest Section of Friends of the Pleistocene, May 19-21, 1995, at Southern Illinois University, Carbondale. Grimley also led stop six on the trip.

Robert A. Bauer participated in a field trip given for the Central United States Earthquake Consortium's Emergency Managers, November 29-30, 1994, in Memphis, TN, that was held in conjunction with a meeting covering contract deliverables and proposed research for the next contract.

Subhash B. Bhagwat, Chen-Lin Chou, Donald F. Oltz and **Colin G. Treworgy** attended the 102nd annual meeting of the Illinois Mining Institute, September 22-23, 1994, in Collinsville. Bhagwat also attended the U.S. Department of Energy's conference on "Energy in an Urban Environment," November 15, 1994, in Chicago; the Illinois Energy Conference, November 16-17, 1994, in Chicago; a meeting of the Chicago Chapter of the Society of Mining Engineers, November 17, 1994, in Chicago; a meeting of the Illinois Basin Section of the Society of Petroleum Engineers, January 19, 1995, in Grayville; the annual meeting of the Society of Mining Engineers, March 6-9, 1995, in Denver, CO; and a conference on the Critical Trends Assessment Project, April 12, 1995, in Champaign. **Bhagwat, John M. Masters** and **Oltz** represented the ISGS at the Illinois Association of Aggregate Producers' annual director's reception and dinner, May 3, 1995, in Springfield.

Ross D. Brower helped with the administration of the Midwest Groundwater Conference, October 16-18, 1994, in Bismarck, ND, during which he also attended a field trip of the Prairie Couteau Wetlands. **Brower, William S. Dey, David R. Larson, Edward Mehnert** and **Edward C. Smith** attended the spring meeting of the Illinois Groundwater Association, March 22, 1995, in Batavia.

Somendra Chakravorty attended a field trip on the Glacial Geology and Geomorphology of Northeastern Illinois, led, in part, by **Michael J. Chrzastowski** and hosted by the Association of Engineering Geologists, September 24, 1994, and participated in the Northwest Waste to Energy Facility Tour, hosted by the Illinois Association of Environmental Professionals, June 17, 1995, in Chicago.

Chusak Chaven chaired a session on the American Society for Testing and Materials' (ASTM) Coal Sample Database at the ASTM Committee DO5 on Coal and Coke, October 1994, in Denver, CO.

Heinz H. Damberger, Joseph A. DeBarr, Gwen L. Donnals, Latif A. Khan, John M. Lytle and **Donald F. Oltz** attended the Illinois Clean Coal Institute's 12th annual Contractors' Technical Meeting, August 2-3, 1994, in Champaign. Damberger was also in charge of the entire annual meeting of the Illinois Mining Institute, September 22-23, 1994, in Collinsville. He attended the meeting of the Illinois Basin Consortium on December 5, 1994, in New Harmony, IN, to discuss the consortium's basinwide coal-quality project. For the meeting of the Ohio Valley Mineral Consortium on the "Impact of Hazardous Air Pollutants on Mineral Producers and Coal Burning Plants in the Ohio Valley," March 19-21, 1995, in Lexington, KY, he helped plan the event and served as moderator of a session on "Trace Elements in Coal." Damberger organized the program, working with the Survey's coal researchers and the Acting Chief, for the annual meeting of the Survey's Coal Advisory Committee, May 15, 1995, in Champaign. During that meeting, he also gave a talk on the "Proposal for basinwide characterization of coal quality of significant coal beds:

atlas of coal quality maps for the Illinois Basin." In addition, he attended the annual meeting of the Illinois Coal Development Board, May 17, 1995, in Springfield, during which he helped host an exhibit on the high-value products from Illinois' coals. **Damberger** and **Dennis R. Kolata** participated in the field trip to the LaSalle-Peru area, August 27, 1994, hosted by the Department of Geology at the University of Illinois-Urbana.

William S. Dey attended the annual meeting of the American Society of Agricultural Engineers, June 19-23, 1995, in Chicago. **Dey** and **David R. Larson** attended the fall meeting of the Illinois Groundwater Association, October 6, 1994, in Springfield.

Gary B. Dreher, Michael A. Phillips, Richard J. Rice, Nancy L. Rorick and **C. Pius Weibel** attended the 5th Annual Conference of the Illinois Groundwater Consortium, March 29-30, 1995, in Makanda on "Research on Agricultural Chemicals in Illinois Groundwater: Status and Future Directions V."

Paul B. DuMontelle attended the annual meeting of the Association of Engineering Geologists, October 1-7, 1994, in Williamsburg, VA. In addition, **DuMontelle, Leon R. Follmer, Jonathan H. Goodwin** and **Ardith K. Hansel** attended the annual meeting of the Geological Society of America, October 24-27, 1994, in Seattle, WA. Prior to the meeting, **Follmer** took a GSA-sponsored tour of the Missoula Floods in Washington, October 18-22, 1994.

John P. Grube attended meetings of the Illinois Geological Society, November 11, 1994, in Fairfield; January 12, 1995, in Mt. Vernon; March 9, 1995, in Fairfield; and May 11, 1995, in Mt. Vernon. He attended meetings of the Society of Petroleum Engineers, November 17, 1994, in Grayville; January 11, 1995, in Pontiac; and March 16, 1995, in Grayville.

Keith C. Hackley attended the Geochemical Society of America's meeting in conjunction with the annual meeting of the Geological Society of America, October 24-27, 1995, in Seattle, WA.

Ardith K. Hansel attended a Midwest Glaciology meeting, April 21-22, 1995, in Chicago; and the 29th annual meeting of the North-Central and South Central Sections of the Geological Society of America, April 27-28, 1995, in Lincoln, NE. She also led a field trip of the Crystal Lake area and Sterne's Woods Park, July 13, 1994, for students working on a wetland research project near Crystal Lake with the ISGS through the Johns Hopkins University's Center for Talented Youth Program.

Jennifer K. Hines, Christopher S. McGarry and **Daniel O. Nelson** attended the Midwest ARC/INFO User Conference, September 19-21, 1994, in St. Louis, MO. **Hines** and **Lisa R. Smith** attended the ESRI User Conference, May 22-26, 1995, in Palm Springs, CA.

Bryan G. Huff prepared a guidebook on "Oil and Gas Development in Illinois and Field Stop at Mattoon Field, Coles County, Illinois" for the field trip given October 29, 1994, by the Department of Geology at the University of Illinois-Urbana.

Russell J. Jacobson helped lead and spoke during stops of the ISGS' geological science field trips to the Elizabeth area, September 17, 1994; the Casey-Martinsville area, October 8, 1994; the Salem area, April 22, 1995; and the Pekin area, May 20, 1995.

Gregory A. Kientop gave a half-day presentation on the geology of northern Illinois, December 1, 1994, during a field trip for the College of DuPage's Environmental Careers Class.

Myrna M. Killey attended the annual meeting of the American Institute of Professional Geologists (AIPG), October 12-15, 1994, in Flagstaff, AZ, participating in a field trip to Meteor Crater, the Petrified Forest and the Painted Desert, October 15. She also attended meetings of the Executive Committee of the AIPG, July 16, 1994, in Denver, CO; and of the Executive Committee of the Illinois-Indiana Section of AIPG, November 21, 1994 and February 10, 1995, in Covington, IN. Killey also helped staff the ISGS' exhibit for Coal Awareness Week, September 27-28, 1994, in Springfield.

Robert J. Krumm and **Christopher S. McGarry** attended the meeting of the Illinois Mapping Advisory Committee, August 25, 1994, in Champaign. Krumm also attended the Western States Cluster Meeting of the U.S. Geological Survey, September 26-27, 1994, in Denver, CO, participating in a field trip on swelling soils led by the Colorado Geological Survey on September 27.

Zakaria Lasemi participated in a field trip to south-central Kentucky, through the University of Cincinnati, to examine carbonate mud mounds in the Fort Payne Formation during September 1994. He also attended meetings of the Illinois Geological Society, November 11, 1994, in Fairfield; January 12, 1995, in Mt. Vernon; and March 9, 1995, in Fairfield; as well as a meeting of the Society of Petroleum Engineers, November 17, 1994 in Grayville.

John M. Masters attended the International Field Conference on Carbonate-Hosted Lead-Zinc Deposits, June 2-6, 1995, in St. Louis, MO, and a post-meeting field trip to the southern Illinois fluorite mining district.

Christopher S. McGarry attended the meeting of the Greater Illinois Section of the American Planners Association, June 2, 1995, in Bloomington.

E. Donald McKay attended a meeting of the Illinois Basin Consortium, December 5, 1994, in New Harmony, IN, and the Illinois Mapping Advisory Committee's meetings, August 25, 1994, in Champaign, February 23, 1995, in Springfield and June 6, 1995, in Champaign. He also attended the meeting of the American Geophysical Union, December 5-8, 1994, in San Francisco CA. In addition, McKay attended the U.S. Geological Survey's Central Region Cluster Meeting, April 3-4, 1995, in New Harmony, IN, and the post-meeting field trip on the Wabash River to view paleoliquefaction structures near Vincennes, IN.

Donald G. Mikulic led a stop at the Waukesha Lime & Stone Company's quarries for the 1994 Annual Fall Geology Field Conference of the Western Section of the American Institute of Professional Geologists, September 30-October 1, 1994, in Waukesha, WI. He attended the Tri-State Geological Field Conference, October 15-16, 1994, in DeKalb. Mikulic led members of the Association of Engineering Geologists on a Spring Field Trip, May 20, 1995, to Material Service Corporation's quarry at Thornton.

David G. Morse attended the technical meetings of the Illinois Geological Society on September 11, 1994, in Mt. Vernon; October 14, 1994, in Grayville; November 10, 1994, in Fairfield; and May 11, 1995, in Mt. Vernon. He also attended the meeting of the Illinois Basin Consortium, September 12, 1994, in Evansville, IN. **Morse** and **Donald F. Oltz** attended the annual meeting of the American Association of Petroleum Geologists, March 6-8, 1995, in Houston, TX.

Donald F. Oltz attended the meeting of the Clean Coal Research Association, July 21, 1994, in Charleston; the meeting of the Illinois Oil and Gas Association (IOGA), August 15, 1994, in Effingham and IOGA's annual meeting, March 2, 1995, in Evansville IN; meetings of the Illinois Geological Society, September 8, 1994, in Mt. Vernon; November 11, 1994, in Fairfield and April 20, 1995, in Grayville; and meetings of the Society of Petroleum Engineers, January 19, 1995, in Grayville and May 10, 1995, in Pontiac. He presented an update on the Petroleum Technology Transfer Council at the Illinois Basin Consortium's meeting, April 17, 1995, in New Harmony, IN.

Massoud Rostam-Abadi participated in the 1995 Electric Power Research Institute/U.S. Environmental Protection Agency's SO_2 Control Conference, March 28-31, 1995, in Miami Beach, FL.

Beverly Seyler attended meetings of the Illinois Geological Society, September 8, 1994; November 10, 1994; February 9, 1995; and April 14, 1995.

Barbara J. Stiff attended a meeting of the Central United States Earthquake Consortium, February 22, 1995, in St. Louis, MO; and an ARC/INFO Seminar, June 29, 1995, in Springfield.

Christopher J. Stohr gave an "Introduction to GPS" as part of the Surveying Update Session at the Illinois GIS Association's Summer Conference, June 7, 1995, in Champaign.

Wen-June Su made a speech, "Paleoliquefaction features in southern Illinois and their implication in regional seismic assessment," at the 58th Annual Tri-State Geological Field Conference, October 15, 1994, at Northern Illinois University, DeKalb.

Emmanuel O. Udegbunam attended the meeting of the Midwest Gas Storage Section of the Society of Petroleum Engineers, January 11, 1995, in Pontiac.

C. Pius Weibel attended the 1994 Annual Fall Field Conference of the Great Lakes Section of the Society of Economic Paleontologists and Mineralogists, September 23-24, 1994, in East Lansing, MI, during which he attended a field trip on the Geohydrology of Carboniferous Aquifers: Applications of Sedimentary Petrology/Mineral Diagenesis to Interpretation of Pore Fluid Evolution in the Michigan Basin.

Charles J. Zelinsky addressed participants attending the Survey's earth science field trip to Lawrenceville regarding the ISGS' Samples and Records libraries.
In addition, he hosted the ISGS' display at the annual meeting of the Illinois Oil and Gas Association, March 2, 1995, in Evansville, IN.

Lectures/Classes/Seminars Taught/Advising Graduate Students

Robert A. Bauer presented the seismic expectations and the history of earthquakes in the Midwest, February 14, 1995, at a course for instructors to learn how to teach post-earthquake assessment of damages to buildings.

Richard C. Berg taught a class on "Groundwater and Geologic Mapping" for Civil Engineering 357, October 13, 1994, at the University of Illinois-Urbana and a class on "Geologic Mapping for Groundwater Protection" for the teachers' in-service day at the Champaign County Cooperative Extension Unit, April 22, 1995, Champaign.

Chen-Lin Chou gave a lecture on "1990 Clean Air Act Amendments: compliance strategies and impact on the coal mining industry" to students in a Coal Mining Development and Production class, Department of Mining Engineering, at the University of Missouri, December 6, 1994, in Rolla, MO.

Mei-In Melissa Chou serves on Linda Liu's dissertation committee for her Master of Science Degree in Chemistry from Western Kentucky University at Bowling Green, KY. Her research topic is the "Behavior of Chlorine in Illinois Coals Compared with That in British Coals during Combustion and Pyrolysis."

Michael J. Chrzastowski gave a seminar on the impacts of the 1993 Mississippi River's flooding in Illinois to a class in the Geography Department of Western Illinois University, September 22, 1994, in Macomb. As a member of the Department of Geology's Alumni Advisory Group at the University of Delaware, he provides informal advice to two graduate students in the coastal geology program.

Heinz H. Damberger gave 10 lectures on coal to a class on "Geology of Energy Resources" at the University of Illinois-Urbana during the fall 1994 and spring 1995 semesters. For members of the university's Geology Club, he organized and led a field trip to the Turris underground coal mine January 14, 1995, near Springfield.

Gary B. Dreher served on the thesis committee for **William P. Green** who received his M.S. Degree in Agronomy from the University of Illinois-Urbana, May 1995. His thesis was "Plant response to coal slurry solids amended with fluidized bed combustion waste."

Paul B. DuMontelle serves on **Wen-June Su**'s Dissertation Committee at the University of Illinois-Urbana.

Leon R. Follmer lectured to students in Geography 371 on research methods in earth sciences, November 29, 1994, at the University of Illinois-Urbana. He is a member of the academic committees or supervises special credit courses and consults on research design and interpretations for the following students, attending the University of Illinois-Urbana, except where indicated: **B. Brandon Curry**, Ph.D., who completed study on "Ostracodes and geochronology of post-Illinoian deposits in Illinois;" **David Grimley**, Ph.D., in progress, on "Magnetic susceptibility studies in loess;" **David Voorhees**, Ph.D., in progress, on "Genesis of glacial stone pavements;" **Larry Abbatt**, Ph.D., in progress, Department of Geography, on "The genesis of soils in post-glacial loess in Illinois;" **Cindy Balek**, Ph.D., completed, Department of Geography, on "The genesis of stone zones in a Sangamon Soil catena;" **Christopher J. Stohr**, Ph.D., in progress, Department of Agronomy, on "Remote sensing of landfill covers;" **Hong Wang**, Ph.D., in progress, Department of Anthropology, on "Stable isotope study of paleosols in loess;" **Robert Bowen**, Ph.D., Department of Environmental Anthropology, who is developing a dissertation study on methods of measuring turbidity in surface-water resources; **Andy Limmer**, M.S., Department of Geology, Southern Illinois University (SIU)-Carbondale, on "Quaternary geology of the Caney Creek watershed west of Anna, Illinois;" and **David Labreque**, M.S., Department of Geology, SIU-Carbondale, new student, developing a proposal to study the Quaternary terraces of the eastern Cache Valley.

Keith C. Hackley gave a lecture on groundwater geochemistry to nine high school students associated with the Johns Hopkins University's Center for Talented Youth Program, July 11-22, 1994, at the ISGS. The lecture introduced the students to the chemistry of groundwater for use in a research project in a northern Illinois wetland.

Ardith K. Hansel presented a slide show on and talked about the glacial geology of northeastern Illinois and the Crystal Lake area to the students working with the ISGS on a research project at a wetland in Crystal Lake, through the Johns Hopkins University's Center for Talented Youth Program, July 11-22, 1994, in Champaign. She presented a slide show on and talk about the "Glaciers, till genesis and moraine formation in Iceland" in the Department of Geology, September 21, 1994, at the University of Illinois-Urbana. She is also a member of the thesis committee for **David Voorhees**, who is studying the "Origin of homogeneous subglacial tills and their associated stone beds, midcontinent, USA," in the Department of Geology at the University of Illinois-Urbana.

Manoutchehr Heidari is a member of the thesis committee of **Edward Mehnert**, whose thesis is entitled "Aquifer Characterization by Time Series Analysis of a Well Response to Earth Tides or Atmospheric Tides," Department of Civil Engineering, University of Illinois-Urbana. Heidari is also a technical advisor to a project entitled "Solute Movement through Unsaturated Zone under Arid Conditions," the principal investigator of which is **Dr. S. Awadalla**, faculty member of Meteorology, Environment and Arid Land Agriculture, Department of Hydrology and Water Resources Management, King Abdulaziz University, Jeddah, Arabia.

Hue-Hwa Hwang gave a lecture on stable isotopic analysis of oxygen in groundwater samples to students in the Johns Hopkins University's Center for Talented Youth Program who worked on a research project at a wetland in the Crystal Lake area with the ISGS, July 11-22, 1994.

Myrna M. Killey, Dean Timme and **Robert C. Vaiden** co-taught a one-week field geology course at Parkland College, August 4-11, 1994, lecturing on general geology, geology of Starved Rock State Park, glacial geology of Champaign County, and landslides. She also planned and began teaching the first introductory geology class for the ISGS' support staff during June 1995.

Dennis R. Kolata served on dissertation committees for Ph.D. candidates, including **Georg Grathoff**, Department of Geology, University of Illinois-Urbana, on "The Maquoketa Group in the Illinois Basin;" **Tim Paulsen**, Department of Geology, University of Illinois-Urbana, on "The origin and tectonic significance of the Uinta Reentrant in the Sevier Fold-Thrust Belt, Utah;" **Junshe Liu**, Department of Geology, University of Illinois-Urbana, on "The nature and origin of K-feldspar alteration of uppermost Precambrian rocks in west-central Wisconsin;" **Doug McVey**, Department of Geology, University of Cincinnati, on "Constraining Middle Ordovician volcanicity in the Iapetus Ocean area using products of eruptive volcanism;" and **Thomas H. Shaw**, Department of Geology, Queens College, New York City, NY, on "The early Middle Ordovician evolution of the Illinois Basin."

Ivan G. Krapac taught a half-day class on the construction and monitoring techniques for soil liners to students in Civil Engineering 398, February 11, 1995, at the University of Illinois-Urbana.

Zakaria Lasemi advised **David Finkelstein**, a Ph.D. candidate in the Department of Geology at the University of Illinois-Urbana, on methods for preparing carbonate samples for SEM, interpretation of SEM data in relation to original carbonate mineralogy, and isotopic and elemental geochemistry. Results and interpretations were later discussed.

Anthony A. Lizzio has given advice to the following graduate students and/or served on their dissertation committees at the University of Illinois-Urbana: **Joseph A. DeBarr**, M.S., Environmental Science, on "The Role of Free Sites in the Removal of SO_2 from Simulated Flue Gases by Activated Char," May 1995; **Mark P. Cal**, Ph.D., Environmental Engineering, on "Characterization of Gas Phase Adsorption Capacity of Untreated and Chemically Treated Activated Carbon Cloths," December 1994; **Cuneyt A. Feizoulof**, M.S., Environmental Engineering, on "The Effect of Activated Carbon Surface Chemistry on Adsorption of p-Nitrophenol," December 1994; **Jian Sun,** Ph.D., Environmental Engineering, on "Production of Activated Char from Illinois Coal for Natural Gas Storage;" **Todd Brady**, M.S., Environmental Engineering, on "Production of Adsorbent Carbons from Waste Tires for Natural Gas Storage and Multicomponent Air Pollution Control;" and **Michael Daley**, Ph.D., Materials Science and Engineering, who has consulted on aspects of his work pertaining to activated carbon fibers, including determination of their molecular-sieve properties, SO_2 adsorption properties, and surface functional groups. With **Massoud Rostam-Abadi, Lizzio** organized a symposium on the Use of Carbon-Based Materials in Gas Separation, Purification and Cleanup for the Spring National Meeting of the American Institute of Chemical Engineers, March 21-26, 1995, in Houston, TX. He was author or co-author of four of the 13 papers presented at the symposium.

John M. Masters assisted a geology student with heavy mineral identifications for his thesis in the Department of Geology at the University of Illinois-Urbana.

E. Donald McKay is a member of the thesis committee for the following graduate students in the Department of Geography at the University of Illinois-Urbana: **Lisa R. Smith** on "Computer Representations of Subsurface Geology of Glacial Deposits," target date for degree, December 1995; and **Barbara J. Stiff**, M.S. program.

Melisa M. McLean presented a seminar on how the Geographic Information System (GIS) was used to produce preliminary maps and models for McLean County and how these maps can be used for land-use planning, March 31, 1995, to students in a GIS class in the Department of Urban and Regional Planning at the University of Illinois-Urbana.

Duane M. Moore co-presented a seminar for the Ancient Materials and Technologies Program on "Native American pipestones from the Sterling, Illinois area," April 18, 1995, in the Department of Anthropology, at the University of Illinois-Urbana. He is on the dissertation committee for **Georg Grathoff**, Ph.D., Department of Geology, University of Illinois-Urbana, on mineralogical characterization of the Maquoketa Group and the use of this characterization for historical reconstruction.

David G. Morse gave a lecture on "Eolian sediments and their importance to hydrocarbon reservoirs," at the Department of Geology's Colloquium, December 2, 1994, at the University of Illinois-Urbana.

Donald F. Oltz is serving on the dissertation committee of **Hannes E. Leetaru**, Ph.D., Department of Geology, University of Illinois-Urbana, with a thesis on "Sequence Stratigraphy and Petroleum Geology of the Aux Vases Sandstone."

Samuel V. Panno organized and led a two-week workshop for nine high school students from nine states, July 11-22, 1994, through the Johns Hopkins University's Center for Talented Youth. He gave daily lectures on geology, geochemistry, hydrogeology, report writing, presentation techniques, etc. and led field research activities for three days at a fen-wetland complex near Crystal Lake.

James B. Risatti is on the dissertation committees for the following: **Stanley Zagula**, Ph.D., Department of Civil Engineering, Northwestern University, Evanston, on "Evaluation of Column Flotation for Remediation of Sediments Containing Non-Polar Organic Contaminants;" **Barbara Cooper**, Ph.D., Department of Earth and Atmospheric Sciences, Purdue University, West Lafayette, IN, on "Hydrogeology and Hydrogeochemistry of Volo Bog, Lake County, Illinois;" and **Gary L. Salmon**, Ph.D., Department of Chemistry and Biochemistry, Southern Illinois University-Carbondale, on "The Study of the Persistence of Pesticides in Composted Materials."

Massoud Rostam-Abadi, appointed a Visiting Senior Lecturer in the Environmental Engineering Program for the 1994-1995 academic year at the University of Illinois-Urbana, taught Civil Engineering 340: Air Resources Engineering in the fall 1994 and Civil Engineering 497: Transport Processes and Reactions in Air Pollution Engineering in the spring 1995. He also served on the following dissertation and/or thesis committees in Environmental Science and Engineering at the University of Illinois-Urbana: M.S. Committee on the "Development of Adsorbent Carbons from Scrap Tire for Natural Gas Storage," Ph.D. Committee on "Production of Adsorbent Carbon from Illinois Coal for Natural Gas Storage," Ph.D. Committee on "The Characterization of Gas Phase Adsorption Capacity of Untreated and Chemically Treated Activated Carbon Cloths," Ph.D. Committee on "Regeneration of Activated Carbon," and the Ph.D. Committee on "The Development of an Activated Carbon Fiber Cryogenic System to Recover and Reuse Toxic Organic Vapors."

William R. Roy was a member of the following doctoral committees in the Department of Agronomy at the University of Illinois-Urbana: **S. Shen** on the "Effects of structural iron reduction on the hydraulic conductivity and potassium fixation of smectite clays and soils," **C. Xu** on "Organic-clay interactions: atrazine, alachlor and glyphosate," and **D. Huo**.

Gary L. Salmon is serving on the following dissertation/thesis committees in the Department of Geology at Southern Illinois University-Carbondale: "Density Gradient Separation of Coal Macerals" and "Evaluation of the Extent of Contamination in the Grand Calumet River."

Michael L. Sargent assisted Dr. F. Seiwers of the Department of Geology at the University of Illinois-Urbana, in teaching two laboratories, involving the use of rock cores and borehole logs to interpret carbonate and clastic sequences, April 7 and 14, 1995, at the Survey's Annex. Informally, he has assisted **Ron Dixon** and his advisor, **Dr. J. Matthew Davis**, at the University of New Hampshire, on a thesis to determine the paleo-hydrology of the depositional environment of the Lower Ordovician Oneota Dolomite.

Christopher J. Stohr spoke on "Remote Sensing Investigations of Closed Hazardous and Solid Waste Landfills," October 11, 1994, at the Department of Geology's Colloquium, Bowling Green State University, in Bowling Green, OH. He led a field trip for the University of Illinois' Department of Civil Engineering's CE399 class on GeoEnvironmental Engineering to Urbana's landfill, April 9, 1995. Two days later, he lectured that class on "Landfill Covers Research: Past and Current."

C. Pius Weibel gave a seminar and colloquium, November 17, 1994, on "Applications of Sequence Stratigraphy to the Pennsylvanian Strata of Illinois" in the Department of Geology, Southern Illinois University-Carbondale.

Offices/Committee Memberships/Services for Professional/Educational Societies

Robert A. Bauer is the Rock Mechanics Chairman for the North Central Section of the Association of Engineering Geologists (AEG). He is also Manager of the National Rock Mechanics Committee and a member of the National Subsidence Committee of AEG.

Ross D. Brower is the historian for the Midwest Groundwater Conference.

Richard A. Cahill is a member of the Contaminated Aquatic Sediments Specialist Group of the International Association on Water Quality and the Technical Review Panel of the Great Lakes

Protection Fund, as well as the ISGS' representative to the Champaign Chapter of Sigma Xi. He also provided technical review for the American Chemical Society's committee on Environmental Science and Technology.

Somendra Chakravorty is serving a two-year term through 1995 on the Board of Directors of the Illinois Association of Environmental Professionals.

Chen-Lin Chou reviewed a manuscript for each of the following publications: *Geochimica et Cosmochimica Acta, International Journal of Coal Geology*, and *Terrestrial, Atmospheric and Ocean Sciences.*

Michael J. Chrzastowski was the leader of a four-person international editorial team which put together a special issue of the *Journal of Marine Geology.* This issue, which will be published in the summer of 1995, focuses on the Quaternary coastal evolution and is the final product of the International Geologic Correlation Programme Project 274, Coastal Evolution in the Quaternary. Chrzastowski has been a representative for the U.S. Working Group on this project.

Heinz H. Damberger is a member of the Editorial Board and reviewed four papers for the *International Journal of Coal Geology.* He is the Illinois Mining Institute's (IMI) Secretary-Treasurer with responsibilities for all meetings. In addition, he served as Co-Chairman of the program for the 1994 annual meeting and arranged a technical program for the meeting's first day. Damberger is also Editor of the IMI Proceedings, for which he reviewed and edited nine papers. He is a member of the Research and Development Committee for the Coal Division of the Society of Mining Engineers of the American Institute of Mining, Metallurgical and Petroleum Engineers.

Gary B. Dreher reviewed two manuscripts for the U.S. Geological Survey in Denver, CO.

Paul B. DuMontelle is Secretary of the Association of Engineering Geologists through October 1995, Chairman of the Screening Board of the Illinois-Indiana Section of the American Institute of Professional Geologists through 1995, Chairman of the Continuing Education Committee of the Geological Society of America for three years through 1996; and a member of the U.S. Executive Committee of the International Association of Engineering Geologists for four years through 1997.

Sandrine A. Schultz Elinski is Chair of the Social and Food Committee and a member of the Abstracts and Posters Committee for the 1995 Midwest/Great Lakes Arc/Info User Conference, which will be held September 27-29, 1995, in Champaign.

Leon R. Follmer is Co-Chairman of the Illinois Quaternary Association; a member of the Editorial Boards of *Catena* and *International Journal of Soil Science, Hydrology, and Geomorphology*; President of the North American Loess Working Group of the International Union for Quaternary Research; the Secretary-Treasurer of the Paleopedology Commission of the International Union for Quaternary Research; adjunct member of Southern Illinois University's faculty in the Geology Department for graduate students' examination committees; and a member of the International Editorial Advisory Board of the *Journal of Quaternary Science.* Follmer has reviewed about 40 manuscripts as Editor of the Paleopedology Commission and about 10, as a peer reviewer of professional publications.

John P. Grube is Treasurer of the Illinois Geological Society through August 1995.

Ardith K. Hansel is a panel member of the Quaternary Geology and Geomorphology Division of the Geological Society of America (GSA), serving from 1993-1995. She has reviewed four papers for the K. Bryan Award and four portfolios for the Distinguished Career Award. She is also a member-at-large of the Management Board of the North-Central Section of GSA, serving from 1994-1997. In addition, Hansel is a corresponding member, from 1985 to the present, of the Commission on the Genesis and Lithology of Quaternary Deposits of the International Quaternary Association (INQUA) and is also serving as Secretary from 1995 through 1999. She is a corresponding member of INQUA's Subcommission on North American Stratigraphy, serving from 1988 to the present.

Manoutchehr Heidari reviewed a paper submitted to the *Water Resources Bulletin* and two papers submitted to *Ground Water.*

Beverly L. Herzog is a member of the Board of Directors and Chairman of the Nominating Committee of the Illinois Groundwater Association.

Jennifer K. Hines is Chair of the Training Committee and a member of the Planning Committee for the Midwest/Great Lakes Arc/Info User Conference, September 27-29, 1995, in Champaign.

Randall E. Hughes is the Managing Editor of the journal *Applied Clay Science*, serving since 1992. He reviewed six articles for two journals—*Clays and Clay Minerals* and *Mining Engineering.*

Bryan G. Huff served as President of the Illinois Geological Society (IGS) through September 1994, when he became a member of the society's Board of Governors.

Myrna M. Killey served as the National Treasurer of the American Institute of Professional Geologists for two years (1993-1994).

Robert J. Krumm is Coordinator of the Midwest/Great Lakes Arc/Info User Conference, September 27-29, 1995, in Champaign.

David R. Larson is a member of the Board of Directors of the Illinois Groundwater Association (IGA) and the 1995 Groundwater Science Awards Committee of the IGA.

Timothy H. Larson reviewed two papers for a special volume to be published by the Environmental and Engineering Geophysics Society of which he is the Chairman of the Public Affairs Committee from 1994-1996. Larson is also Treasurer of the International Water Resources Association for 1995 and 1996.

Zakaria Lasemi reviewed a manuscript for each of the following: *Sedimentology, Journal of Sedimentary Research,* a publication of the U.S. Geological Survey, and the Department of Geology, University of Illinois-Urbana.

Anthony A. Lizzio has been named Editor of the newsletter for the Division of Fuel Chemistry of the American Chemical Society through August 1998. For scientific journals, he has reviewed two manuscripts for *Fuel* and one manuscript for *Carbon.* Lizzio is the principal organizer and Chairman of the American Chemical Society's Division of Fuel Chemistry's symposium on the "Production and Use of Carbon-Based Materials for Environmental Cleanup" to be held during March 1996 in New Orleans, LA.

John M. Lytle reviewed 10 proposals for outside organizations.

E. Donald McKay is a member of the Board of Directors of the Illinois GIS Association and serves as its Treasurer.

Edward Mehnert reviewed two manuscripts for *Ground Water* and one manuscript for the Illinois State Water Survey.

Duane M. Moore is Historian of the Clay Minerals Society for an indefinite term as of September 1993.

Daniel O. Nelson is a member of the ad hoc planning committee at the ISGS for the Midwest/Great Lakes Arc/Info User Conference, September 27-29, 1995, in Champaign, for which he has helped organize technical sessions and the overall program.

Donald F. Oltz is Director of the Midwestern Regional Lead Organization of the Petroleum Technology Transfer Council, serving in this capacity since 1994; member of the Advisory Council to the American Association of Petroleum Geologists (AAPG) from 1995-1998; Chairman of the Interstate Oil and Gas Compact Commission's Research Committee from 1995-1997;

Eastern Section Councilor to the Division of Environmental Geosciences of AAPG from 1995-1998; and Chairman of the Clean Coal Research Association from 1995-1996. He attended meetings of the PTTC, July 17-18, 1994, in Dallas, TX, October 17-18, 1994, in Tulsa, OK, and June 7, 1995, in Washington, D.C. as the Regional Lead Organization's midwestern representative. He attended the board of directors' meeting of PTTC, February 23-24, 1995, in Norman, OK, and June 22-23, 1995, in Denver, CO. Oltz attended the officers' meeting of the Eastern Section of AAPG, August 1, 1994, in Columbus, OH. As President, he conducted the Eastern Section Meeting of AAPG, September 18-20, 1994, in East Lansing, MI.

Samuel V. Panno reviewed three manuscripts for the journal *Ground Water.*

James B. Risatti reviewed two manuscripts for *Geochimica et Cosmochimica Acta* and one manuscript for the *Journal of Paleontology.* He was Co-Chairman for the "Geochemistry: Aqueous and Biogeochemistry" session at the Geochemistry Society's annual meeting, October 23-27, 1995, in Seattle, WA.

Massoud Rostam-Abadi has been appointed to the International Advisory Board of the Asia-Pacific Workshop on Sustainable Energy and Environmental Technology to be held June 18-20, 1996, in Singapore. He was elected to organize and Chair a symposium on multi-pollutant control at the 1995 annual meeting of the Institute of Chemical Engineers, November 12-17, 1995, in Miami Beach, FL; to organize and Chair a symposium on marketable products from FGD residue and fly ash at the 1996 National Meeting of the American Chemical Society, March 24-28, 1996, in New Orleans, LA; and to be Program Coordinator of the Fuel and Petrochemical Division at the 1996 annual meeting of the American Institute of Chemical Engineers, November 1995, in Chicago.

William R. Roy is a member of the Editorial board and Associate Editor of the *Journal of Environmental Quality* and a member of the Editorial Board of the *Journal of Hazardous Materials.*

Gary L. Salmon is a member of the Advisory Committee of the University of Illinois-Urbana Section of the American Chemical Society. He reviewed four manuscripts for *Organic Geochemistry* and one manuscript for *Geochimica et Cosmochimica Acta.*

Michael L. Sargent is an Institutional Representative of the Geological Society of America at the ISGS.

Lisa R. Smith is Secretary of the Illinois Mapping Advisory Committee, which met August 25, 1994, in Champaign; February 23, 1995, in Springfield; and June 6, 1995, in Champaign.

Christopher J. Stohr is a member of Committee D18.03.01 on Remote Sensing of the American Society for Testing and Materials; Manager of the Remote Sensing Committee and Liaison with the American Society for Photogrammetry and Remote Sensing for the Association of Engineering Geologists; member of the American Congress on Surveying and Mapping; a member of the University of Illinois' Aerial Photography and Remote Sensing Committee; and a member of the Illinois Mapping Advisory Committee. He reviewed a paper for *Photogrammetric Engineering and Remote Sensing* and was Guest Editor for a Special Issue on *Remote Sensing in Solid and Hazardous Waste Management*, August 1994, for the American Society of Photogrammetry and Remote Sensing.

Janis D. Treworgy has served as Vice President of the Great Lakes Section of the Society of Sedimentary Geologists from fall 1994 to fall 1995 to coordinate and run the 1995 Fall Field Conference. In the spring of 1995, she was named a Charter Member of the Board of Trustees for the Museum of Natural History at the University of Illinois-Urbana.

C. Pius Weibel is a member of the Midcontinent Pennsylvanian Stratigraphic Working Group of the Society for Sedimentary Geology and contributes to the advancement of the correlation of Pennsylvanian strata between the Illinois Basin and the midcontinent by participating in field trips and collecting and processing biostratigraphically important rock samples. He is also a member and reviewer of Undergraduate Student Grant Proposals for the Earth Science Division of the

Illinois State Academy of Science and Secretary of the Great Lakes Section of the Society of Sedimentary Geology.

CONTRIBUTIONS TO OTHER GOVERNMENT AGENCIES

Testimony/Information Supplied to Local/State/National Agencies/Committees

Richard C. Berg gave formal testimony to the McHenry County Zoning Board of Appeals on the potential impact of the expansion of a sand and gravel pit and related construction activities on a fen in McHenry County, November 30, 1994, in Woodstock. He also gave a presentation on the "McHenry County Geologic Mapping Project," December 6, 1994, at the City Council meeting in Woodstock.

Ross D. Brower, Philip C. Reed and **Timothy C. Young** reported to representatives of the Abandoned Mined Lands Reclamation Council, May 22, 1995, in Springfield, on the results of their geophysical logging performed on a well in Knox County.

Richard A. Cahill provided extensive documents relating to sediment sampling and analysis concerning sediments of the Grand Calumet River, Indiana Harbor Ship Canal, and water bodies in Lake County, Indiana, or Cook County to the U.S. District Court, August 12, 1994, in Chicago.

Chen-Lin Chou prepared a letter report to the Illinois Department of Mines and Minerals regarding the assessment of natural radioactivities in black shales as compared to coal and the background.

Michael J. Chrzastowski and **C. Brian Trask** discussed the Survey's compilation of data to evaluate the feasibility of beach nourishment along Lake Michigan's shore from Waukegan to Wilmette at a meeting of the North Shore Beach Nourishment Task Force, July 26, 1994, in Highland Park. Chrzastowski also made a presentation on erosion problems along the shore of Chicago's Northerly Island at the Lake Michigan Federation-sponsored meeting, December 14, 1994, in Chicago. He met with lawyers for the Chicago Park District on January 26, 1995, in Chicago to provide information on underwater conditions along Chicago's stepped revetments. This information was relevant to a pending law suit concerning a near-fatal injury to a swimmer.

William S. Dey made a presentation on "Livestock waste and groundwater quality" and **Ivan G. Krapac**, on "Soil Liners" to the state's Hog Confinement Legislative Task Force, January 30, 1995, in Springfield.

Anne L. Erdmann with **Robert A. Bauer** presented information concerning the ISGS' information and data resources at a meeting held jointly by the Federal Aviation Administration and the Illinois Department of Transportation regarding the proposed Chicago-Indiana metropolitan area's third-airport site at Peotone on January 11, 1995, in Park Forest. At an interagency planning meeting convened by the Federal Emergency Management Agency (FEMA), March 29, 1995, in Pittsfield, **Erdmann** and **Michael A. Phillips** presented information concerning potential environmental hazards that might be encountered at the proposed wetlands mitigation site in East Hannibal. Erdmann also presented information on the geology and potential geologic hazards of the proposed new site for the town of Appleton at a meeting convened by FEMA, April 18, 1995, in Appleton.

Beverly L. Herzog presented a semi-annual progress report on the project to define the groundwater resources of southeastern Tazewell and southwestern McLean counties to a joint meeting of the Bloomington and Normal City Councils and McLean County Board on October 26, 1994, and presented a progress report to the Mahomet Valley Water Authority on the project in Piatt and DeWitt counties, February 3, 1995. She also presented the paper, "Groundwater Geology of the Buried Mahomet Valley Aquifer System Focusing on DeWitt and Piatt Counties," at the annual meeting of the Mahomet Valley Water Authority, March 15, 1995.

Randall E. Hughes gave testimony in the land-condemnation pretrial hearings in the case between the Michel Land Trust and the U.S. Army Corps of Engineers wherein the owners of a mine in the Porter's Creek Clay are suing for fair market value of the clay remaining in a mine that was ceded to the Corps by the American Colloid Co.

Robert J. Krumm and **Melisa M. McLean** presented information on the ISGS' County Assistance Project, March 1, 1995, to the Lee County Solid Waste Committee in Dixon and to the Jo Daviess County Board in Galena, explaining the importance of geologic mapping to the siting of a solid-waste facility.

Timothy H. Larson presented information on seismic hazards to the Illinois Low-Level Radioactive Waste Siting Task Force, March 14, 1995, at a hearing in Rosemont. He also presented information on groundwater and geophysics to the Aledo City Council, June 10, 1995, in Aledo.

Christopher S. McGarry and **Melisa M. McLean** presented general information regarding geologic mapping for landfill screening and a set of preliminary maps produced for McLean County, April 25, 1995, at the meeting of the Illinois Association of County Zoning Officials, in Springfield.

E. Donald McKay attended the Low-Level Radioactive Waste (LLRW) Task Group's meetings, October 17, 1994, in Matteson; December 13, 1994, in Champaign; February 1-3, 1995, in Rosemont; and May 11-12 and June 26-27, 1995, in Springfield, during which he was asked to comment on geological aspects of criteria being considered for the statewide screening project.

Melisa M. McLean presented preliminary maps and models produced for McLean County to the county's officials and the new McLean County Solid Waste Coordinator, January 24, 1995, in Champaign.

Donald F. Oltz has presented informal testimony in Washington, D.C., to Patricia Godley, Assistant Secretary for Fossil Energy, regarding the need for continuing research funding for oil and gas.

James B. Risatti sent a solicited letter of advice to the Illinois Department of Conservation (IDOC) concerning the effects of an asphalt manufacturing plant on the quality of water in the Volo Bog Natural Area. He gave formal testimony at the public hearings held by Volo regarding the multi-use zoning of land adjacent to the natural area. Risatti had a conference with representatives of the IDOC regarding the hydrology and effects of establishing an asphalt plant adjacent to the area. In addition, he advised the IDOC's office in the Volo Bog Natural Area on the management of water quality for the area.

C. Brian Trask discussed erosion at North Point Marina, February 14, 1995, with personnel from the Illinois Department of Conservation in Springfield.

Participation on Local/State/National Government Advisory Committees

Robert A. Bauer is a member of the National Mined Land Reclamation Center -Midwest Region Advisory Committee which met January 5, 1995, in St. Louis, MO, to review and rank final project proposals for further consideration by the U.S. Bureau of Mines' review process.

Richard C. Berg and **Beverly Herzog,** are co-representatives of the ISGS on the Interagency Coordinating Committee on Groundwater, which meets quarterly in Springfield. He is also a member of the American Society for Testing and Materials' work group to develop a guide for determining the sensitivity and vulnerability of aquifers.

Richard A. Cahill serves in an advisory capacity to the Sediment Work Group of the U.S. Environmental Protection Agency and NOAA/GLERL, Lake Michigan Mass Balance Steering Committee. He is the alternate representative for **Michael V. Miller** on the state's Interagency

Wetlands Committee. In addition, Cahill is a member of the Radiation Hazards Committee of the University of Illinois.

Heinz H. Damberger is a member of the Steering Committee of the U.S. Department of Energy's Energy Information Administration's Coal Reserve Assessment Program, for which he reviewed the progress and final reports on coal reserve base reassessment by the Kentucky Geological Survey. He is also on the roster of reviewers for research proposals on coal for the National Science Foundation. In addition, Damberger was elected Chairman of the Advisory Committee of the Illinois Basin Coal Sample Program on March 29, 1995.

Paul B. DuMontelle is a Boneyard Creek Commissioner for the City of Urbana and reviewed four construction projects this year for the Urbana Planning Office.

Leon R. Follmer is a member of the U.S. National Committee of the International Quaternary Association, established by the U.S. National Academy of Science through the National Research Council.

Ardith K. Hansel has been a member of the Technical Review Panel of the Great Lakes Protection Fund since 1990 and reviews the fund's proposals when an expertise in geology is required.

Beverly L. Herzog is a member of the Executive Committee of the Illinois Groundwater Consortium, the Advisory Committee for the U.S. Geological Survey's National Water Quality Assessment Project on the Lower Illinois River, and the Board of Directors of the Abandoned Well Sealing Coalition.

Randall E. Hughes is a member of Volunteers in Technical Assistance, which helps start up businesses in developing countries.

John M. Lytle is a non-voting member of the Advisory Committee to the Illinois Basin Coal Sample Program, a member of the Technical Advisory Committee for the Coal Combustion Residue Management Program since 1993, and a member of the Illinois Clean Coal Institute's Program Committee since 1993.

E. Donald McKay is Assistant to the Secretary and Meeting Program Coordinator of the Illinois Geologic Mapping Advisory Committee. He is a member of the Technical Advisory Committee of the U.S. Department of Agriculture's Soil Conservation Service (SCS), which met December 2, 1994, and advises the state office of the SCS on technical issues such as the implementation of a Geographic Information System (GIS). McKay is a member of the Illinois Mapping Advisory Committee (IMAC), which met August 25, 1994, February 23, 1995, and June 6, 1995 and advises the U.S. Geological Survey on geologic mapping. He is specifically a member of IMAC's Subcommittee on Digital Data Quality and Standards and the Subcommittee on Tax Assessment Mapping. McKay is a member of the Illinois GIS Committee, an advisory committee to DNR comprised of GIS managers from the various divisions and offices in the agency, and the EDP Transition Subcommittee, an advisory committee to the Director of DNR. He has met with the Champaign County GIS and Computer Network Implementation Committee and has volunteered time on the Policy Subcommittee. McKay has served the Connecticut Yankee Ingenuity Grant Program as an expert reviewer of proposals with GIS components, reviewing six proposals this year.

Edward Mehnert is a member of the Pesticide Subcommittee of the Interagency Coordinating Committee on Groundwater, which met September 16 and October 12, 1994, to revise a generic state management plan for pesticides from comments from subcommittee members and the public.

Michael V. Miller is a member of the Interagency Wetlands Committee (IWC) of the Department of Natural Resources; the Wetlands Committee, established by the Natural Resources Coordinating Council, which meets monthly in conjunction with the IWC; and the Watershed Priority Committee of the Department of Agriculture. He also attends meetings of the Illinois Wetlands Coordination Group to which state employees involved in wetlands efforts have been invited.

Russel A. Peppers is a member of the Midcontinent Pennsylvanian Stratigraphic Working Group of the Society of Economic Paleontologists and Mineralogists and the Working Group of the Subcommission on Carboniferous Stratigraphy of the International Union of Geological Sciences. **Christopher J. Stohr** is a member of the Illinois Mapping Advisory Committee.

C. Brian Trask is Chairman of the Champaign Environmental Advisory Commission.

C. Pius Weibel is the Technical Advisor to the Flooding Section of the Technical Advisory Committee of the Embarras River Management Association, which met January 26, 1995, in Greenup and February 23, 1995, in Charleston.

CONTRIBUTIONS TO THE PUBLIC AND INDUSTRY

Popularized Addresses/Presentations for Civic Groups/Public Meetings

Robert A. Bauer gave a presentation on "The Earthquake Threat in the Midwest" at the Midwest Funeral Directors' meeting, October 20, 1994, in Mt. Vernon and a lecture on "Earthquakes in the Midwest and Their Potential Impact to the Seven-State Region of the National Guard" (Minnesota, Iowa, Illinois, Wisconsin, Indiana, Michigan and Ohio) at a meeting of the regional Emergency Preparedness Liaison Officers, June 10, 1995, in Milwaukee, WI.

Richard C. Berg gave a presentation on "Groundwater Protection Studies," September 21, 1994, at the Urbana Exchange Club, Urbana.

Michael J. Chrzastowski made a presentation on the impacts of the 1993 flooding in Illinois at the First Presbyterian Church, September 27, 1994, in Champaign.
He spoke on the contrasts in geologic features in southern and northern Poland at a meeting of the Chicago Rocks and Minerals Club, October 8, 1994, in Chicago. In addition, Chrzastowski talked about Lake Michigan's coastal erosion at the Forest Bluff Garden Club on January 9, 1995, in Lake Forest. Several interviews with him resulted in a front-page story with color maps, focusing on the ISGS' work related to coastal erosion and dwindling resources of sand along the Lake Michigan shoreline in Illinois, April 7, 1995, in the *Chicago Tribune*.

Ben Brandon Curry lectured on the nature of the geological profession to seventh-grade students during "Geology" Career Day at Parkland College, May 18, 1995, in Champaign.

Joseph A. Devera gave a talk on "Dinosaurs in Illinois" to the Southern Illinois Rock and Minerals Club, April 13, 1995, in Benton. He made numerous presentations on the prehistoric life of southern Illinois to nearly 3,000 grade school children during Stewardship Week, April 25-28, 1995, at the Illinois Forest Resource Center. In addition, Devera led a geologic field trip for students in the fourth grade at Logan School in Murphysboro, May 30, 1995.

William S. Dey discussed groundwater protection with the public at the Department of Energy and Natural Resources' exhibit during the Farm Progress Show in the fall of 1994 in Bloomington.

Anne L. Erdmann's interview with Julie Wurth of *The News Gazette,* concerning the ISGS' involvement with the relocation of the town of Valmeyer, was a front page story, Sunday, August 7, 1994.

Beverly L. Herzog presented a talk on "Current Research in Groundwater Protection," July 6, 1994, at the Exchange Club of Urbana.

Russell J. Jacobson gave the following talks: "Dinosaur Work at Sundance, WY," November 23, 1994 and February 1995, at the State Museum, and "Dinosaurs" during May 1995 at the Champaign Public Library.

Myrna M. Killey and **Ivan G. Krapac** gave a talk on "Geology, Rocks and Minerals," April 6, 1995, to the students in third grade at Dr. Howard School, Champaign. She presented a slide-illustrated talk on "Ice Age Geology in Illinois," April 19, 1995, to the Prairie Gem and Geological Society, Urbana. **Killey, Wayne T. Frankie, Russell J. Jacobson** and **David L. Reinertsen** were interviewed, March 30 and April 4, 1995, on videotape in the field and at the ISGS by WUSI-TV, regarding the geological science field trip in the Salem area. **Killey** and **Frankie** were interviewed by a reporter from the *Peoria Journal Star* on May 19, 1995, regarding the field trip in the Pekin area.

Dennis R. Kolata was interviewed by Prof. Laurence Jankowski of Bowling Green State University for two instructional science videos in the "Discovering the Earth" series: "Trilobites" and "The Geology of Illinois." His research on Ordovician volcanic ash beds was featured on May 14, 1995, in the article, "When Volcanoes Ruled the Midwest," in *The News Gazette.*

Timothy H. Larson made a presentation on earthquakes, April 29, 1995, at the Public Library in Champaign.

Zakaria Lasemi was interviewed by the *American Oil & Gas Reporter* for a story in the June 1995 issue.

E. Donald McKay gave numerous demonstrations and presentations on the Geographic Information System and Geologic Mapping, including audiences of 12 staff members from the Field Museum; several members of the General Assembly; staff members of the Illinois Environmental Protection Agency, the Illinois Department of Transportation, the Illinois Emergency Management Agency, the Illinois Department of Agriculture and other state agencies; several classes; and many visitors. He participated in the preparation of documentary footage on Careers in the Geological Sciences, filmed by Haynes Science Career Documentaries, reviewed and commented on preliminary editing of tapes, and arranged interviews with staff members and filming of field work in Carroll County during October 1994. McKay spoke on "Geologic Mapping in Illinois for Resource Assessment, Hazard Identification, and Environmental Protection during an Earth Week Series, April 19, 1995, at the Department of Geology and Geography at Eastern Illinois University, Charleston.

Donald G. Mikulic led a field trip to Material Service Corporation's quarry at Thornton for members of the Chicago Academy of Sciences on September 10, 1994, and presented a lecture on quarry history for the Material Service Corporation, January 25, 1995.

James J. Miner discussed with sixth grade students in Kim Jameson's class at North Point Elementary School the potential for creating a wetland in the school yard's detention pond, April 17, 1995, in Bloomington.

Duane M. Moore gave a talk on the nature of crystals and minerals to a group of middle school students, June 13, 1995, in the Department of Geology at the University of Illinois-Urbana.

Daniel O. Nelson conducted a field trip, May 19, 1995, at Johnson's Mound in Kane County for Cub Scout Pack 301 of Aurora, giving a hands-on description and identification of Illinois' rocks and minerals, a discussion of Illinois' glacial geology, and an examination of the significance of Johnson's Mound.

Samuel V. Panno gave his Monroe County Annual Karst Tour and presented two outdoor lectures to more than 100 high school students on karstic geology, karstic hydrogeology and ground-water quality. He was interviewed for news stories by the following: a reporter from *The News Gazette*, July 20, 1994, regarding the Survey's participation in the Center for Talented Youth Program (CTY); a reporter from *Inside Illinois*, September 1, 1994, about the CTY program at the ISGS; a newscaster from WBEZ, Chicago, November 4, 1994, regarding caves and karstic terrain; and a reporter with the Associated Press, November 9, 1994, regarding his work in southwestern Illinois on karstic hydrology and groundwater quality.

Matthew H. Riggs spoke on fossils and dinosaurs during March 1995 to the kindergarten class at Southside Elementary School, Champaign.

James B. Risatti presented a talk on "Wetland Hydrogeology and Chemistry," at the 4th Biennial Wetland Seminar Series, sponsored by Volo Bog Natural Area and The Friends of Volo Bog, April 29, 1995, at Volo Bog in Ingleside.

Nancy L. Rorick presented a program on the hydrologic cycle to grade-school students at Carbondale's New School, July 15, 1994, in Carbondale.

Michael L. Sargent worked with **Paul Wood** of *The News Gazette* on a feature article about "Meteorites Crashing into the Midwest," which was published August 11, 1994. He also led a field trip to Kentland Quarry for Dr. C. J. Mann and his students on May 6, 1995.

Edward C. Smith gave a talk on the "Geology and Groundwater Resources of Jefferson County, Illinois" during the well sealing and abandonment demonstration, April 8, 1995, on Groundwater Protection Day.

Beverly Seyler presented a geology program, during April 1995, for students in the fourth grade at Holy Cross School, Champaign. She also led a field trip for and assisted members of Boy Scout Troop 18 in Mahomet to complete requirements for their merit badge in geology.

Janis D. Treworgy made a presentation on "Coal Mining in Illinois," using slides, hands-on maps, equipment and basic mapping exercises, October 6, 1994, at Countryside School in Champaign. She spent seven sessions at the school during April 1995 discussing general topics of major rock types and how and where they form, plate tectonics and volcanoes, and identifying rocks and minerals. For Green Meadows Girl Scout Troop 3 in Urbana, she spent three meetings in April 1995 identifying major features on different types of maps, discussing major rock types and how and where they form, and identifying rocks and minerals.

Robert C. Vaiden presented a class at the Urbana Park District Childrens' Camp on fossils and geology on July 1, 1994. He has presented the "Build Illinois" talk, giving a brief history of Illinois from the Cambrian through the Ice Ages, that incorporates ancient environments, sedimentary rocks, and Pleistocene Glaciers and their relationship to natural resources to many audiences throughout the year. Written up as a school lesson and distributed to participants in the follow-up to the Northern Illinois Middle School Groundwater Project, "Build Illinois" has also been given as a talk three times at the Illinois Middle School Groundwater Project at Peoria during which he also lectured on techniques of using a groundwater model, October 18, 1994; six times at a follow-up meeting of the Middle School Groundwater Project in Woodstock, January 20, 1995; continuously over four hours in a shortened version on Illinois geology and the relation to groundwater availability to students in Peoria at the Water Celebration, sponsored by the Sun Foundation, March 20, 1995; and at the Teachers' Workshop for grade school and junior high teachers, sponsored by the State Board of Education, at the Laredo-Taft Campus, June 28, 1995. Vaiden also presented a talk and slide show on fossils, geology and history at the meeting of the Prairie Gem and Mineral Society, November 2, 1994, and talked informally to students at the Career Fair, March 3, 1995, in Mahomet.

OTHER SERVICES TO THE PUBLIC

Philip J. DeMaris was a judge for the Regional Science Fair at Parkland College, April 1, 1995, in Champaign.

F. Brett Denny judged youth mineral collections for the 4-H at the Saline County Fair, July 23, 1994, in Harrisburg and a science fair for students at Goreville High School, April 27, 1995, in Goreville.

John M. Masters served as Judging Chairman of the Earth Science Division of the Illinois Junior Academy of Science (IJAS) for 1994-95. Judges were recruited, organized and supervised as they evaluated junior and senior high school science projects at the IJAS Annual Exposition, May 6, 1995, in Champaign. Judges from the ISGS were **Philip C. Reed**, co-chairman, **Anne L. Erdmann, Randall E. Hughes, Russell J. Jacobson, Edward C. Smith** and **Timothy C. Young**.

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ILLINOIS STATE GEOLOGICAL SURVEY SERIES

Circulars

555 *Geology of Microcrystalline Silica (Tripoli) Deposits, Southernmost Illinois.* 1994. **R.B. Berg, J.M. Masters**. 89 p., 45 figs., 6 tables, 10 sections, 1 plate.

556 *Quaternary Geology of the Martinsville Alternative Site, Clark County, Illinois: A Proposed Low Level Radioactive Waste Disposal Site.* 1994. **B.B. Curry,** K.G. Troost, and **R.C. Berg**. 85 p., 46 figs., 6 tables.

Cooperative Report

16 *The Sankoty–Mahomet Aquifer in the Confluence Area of the Mackinaw and Mahomet Bedrock Valleys, Central Illinois: A Reassessment of Aquifer Characteristics.* S.P. Wilson, **J.P. Kempton**, and R.B.Loft. 1995. 64 p., 17 figs., 5 tables.

Environmental Geology

147 *Geotechnical Site Investigation for an Advanced Photon Source at Argonne National Laboratory, Illinois.* 1995. **M.M. Killey and C.B. Trask**. 46 p., 30 figs., 7 tables, 1 plate.

148 *Potential of Agricultural Chemical Contamination of Aquifers in Illinois: 1995 Revision.* 1995. **D. A. Keefer**. 28 p., 2 figs., 9 tables., 5 plates.

Guidebook Series

1995-A *Guide to the Geology of the Salem Area, Marion County, Illinois.* 1995. **W.T. Frankie, R.J. Jacobson, M.M. Killey, M.A. Phillips, D.L. Reinertsen, C.J. Zelinsky**, R. Barrett, J. Hankinson, and M. Redding. 58 p. + appendix.

1995-B *Guide to the Geology of the Pekin Area, Tazewell, and Peoria Counties, Illinois.* 1995. **W.T. Frankie, R.J. Jacobson, S.L. Reinertsen**, R.S. Nelson, and D.H. Malone. 56 p. + appendix.

1995-C *Guide to the Geology of the Elizabeth Area, Jo Daviess County, Illinois.* 1995. **D.L. Reinertsen and W.T. Frankie**. 34 p. + appendix.

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Illinois Maps

3 *Stack-Unit Map of Paducah 1° x 2° Quadrangle: Geologic Materials to a Depth of 15 Meters.* 1994. **R.C. Berg and M.R. Greenpool**. Scale, 1:250,000. Size, 44 x 32 inches.

5 *Buried Bedrock Surface of Illinois.* 1994. **B. L. Herzog, B.J. Stiff, and Cheri A. Chenoweth**, (ISGS); Kelly L. Warner, Jennifer B. Sieverling, and Charles Avery, (USGS). Scale, 1:500,000. Size, 34 x 60 inches.

Illinois Mine Subsidence Research Program

VI *Bibliography of Selected References Related to Subsidence: An Update*. 1994. **B.A. Trent, R.A. Bauer, and P.B. DuMontelle**. 1994. 486 p.

VII *Planned Coal Mine Subsidence in Illinois: A Public Information Booklet*. **R.A. Bauer, B.A. Trent, B.B. Mehnert, and D.J. Van Roosendaal**. 1995. 32 p.

VIII *Application of Surface Geophysics to Detection and Mapping of Mine Subsidence Fractures in Drift and Bedrock*. 1994. P.J. Carpenter, C.J. Booth, and M.A. Johnston. 1995. 21 p.

IX *Subsidence Investigations over a High-Extraction Retreat Mine in Williamson County, Illinois: Final Report*. **B.B. Mehnert, D.J. Van Roosendaal, R.A. Bauer, D. Barkley, and E. Gefell**. 1995. 67 p.

Illinois Minerals

112 *Illinois Mineral Industry in 1992 and Review of Preliminary Mineral Production Data for 1993*. 1994. **I.E. Samson**. 43 p., 16 figs., 25 tables.

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144 *Oil and Gas Developments in Illinois, 1987*. 1994. **B.G. Huff**. 72 p., 2 figs., 11 tables.

145 *An Integrated Geologic and Engineering Model for Improved Reservoir Development and Management at Energy Field, Williamson County, Illinois*. 1994. **E.O. Udegbunam and B.G. Huff**. 25 p., 18 figs., 9 tables.

146 *An Integrated Geologic and Engineering Study of the Plumfield Lease Aux Vases Reservoirs, Zeigler Field, Franklin County, Illinois*. 1994. **S.K. Sim, B. Seyler, and E.O. Udegbunam**. 29 p., 25 figs., 4 tables.

147 *The Cypress Sandstone (Mississippian) Reservoir and Its Recovery Potential at Xenia East Oil Field, Clay County, Illinois*. **J.Xu and B.G. Huff**. 1995. 47 p., 6 pls., 28 figs., 3 tables.

148 *Formation Water Chemistry and Modeling of Fluid–Rock Interaction for Improved Oil Recovery in Aux Vases and Cypress Formations, Illinois Basin*. 1995. **I. Demir**. 60 p., 33 figs., 16 tables.

149 *Stratigraphic Framework and Environments of Deposition of the Cypress Formation in the Outcrop Belt of Southern Illinois*. 1995. **R.D. Cole and W.J. Nelson**. 47 p., 28 figs., 1 separate map.

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1994-6 *11:30 O'Clock Cross Section in the Illinois Basin : Wayne County, Illinois to Stephenson County, Illinois*. [cross-section] 1994. **J.D. Treworgy, S.T. Whitaker, and Z.Lasemi**. *Stratigraphic and Structural Framework along the 11:30 O'Clock Cross Section in the Illinois Basin: Wayne County, Illinois, to Stephenson County, Illinois*. **J.D. Treworgy, S.T. Whitaker, and Z.Lasemi.** [booklet] 17p.

1994-7 *Oswego Wetland Mitigation Site: Final Hydrogeologic Characterization Report (U.S. Route 34 at Waubonsee Creek, Oswego, Kendall County, Illinois)*. 1994. **J.J. Miner, C.S. Fucciolo, and M.V. Miller**. 30 p.

1994-8 *Klein Creek Potential Wetland Mitigation Site: Final Hydrogeologic Characterization Report (Illinois Route 64 at Kuhn Road, Carol Stream, Du Page County, Illinois)*. 1994. **J.J. Miner, C.S. Fucciolo, and R.A. Cahill**. 36 p.

1994-9 *Geophysical Investigation of the Ticona Bedrock Valley Aquifer near Streator, Illinois*. 1994. **T.H. Larson**. 24 p.

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1995-8 *Washability of Trace Elements in Product (Marketed) Coals from Illinois Mines*. 1995. **I. Demir, R.R. Ruch, J.D. Steele, and S. Khan**. 24 p.

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1974-W *Memorial to Morris Morgan Leighton (1887–1971)*. 1995. **L.L. Ray**. (Reprinted from Geological Society of America Memorials, Vol. III, 1974, p. 133–143.)

1992-P *Evolution of Volatile Sulfur Compounds During Temperature-Programmed Pyrolysis-Combustion with a Quadrupole Gas Analyzer*. 1995. **K.C. Hackley and C.-L. Chou**. (Reprinted from American Chemical Society Division of Fuel Chemistry, Preprints of papers, v. 37, no. 2,, p. 738–744, 1992.)

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1993-K *Sorption of Cadmium and Lead by Clays from Municipal Incinerator Ash–Water Suspensions*. **W.R. Roy, I.G. Krapac, and J.D. Steele**. (Reprinted from Journal of Environmental Quality, v. 22, no. 3, p. 537–543, July–September 1993.)

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1994-E *Adsorption and Desorption of Atrazine and Deethylatrazine by Low Organic Carbon Geologic Materials.* **W.R. Roy and I.G. Krapac**. (Reprinted from the Journal of Environmental Quality, v. 23, no. 3, p. 549–556, May–June 1994.)

1994-F *Hydrochemistry of the Mahomet Bedrock Valley Aquifer, East-Central Illinois: Indicators of Recharge and Ground-Water Flow.* **S.V. Panno, K.C. Hackley, K. Cartwright, and C.L. Liu**. (Reprinted from Ground Water, v. 32, no. 4, p. 591–604, 1994.)

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1995-D *The Occurrence of Agricultural Chemicals in Illinois' Rural Private Wells: Results from the Pilot Study.* **E. Mehnert**, S.C. Schock, **M.L. Barnhardt**, M.E. Caughey, **S.F.J. Chou, W.S. Dey, G.B. Dreher,** and C. Ray. (Reprinted from Ground Water Monitoring and Remediation, v. 15, no. 1, p. 142–149, Winter 1995.)

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